The FOUNDRY

Volume 52
Number 21

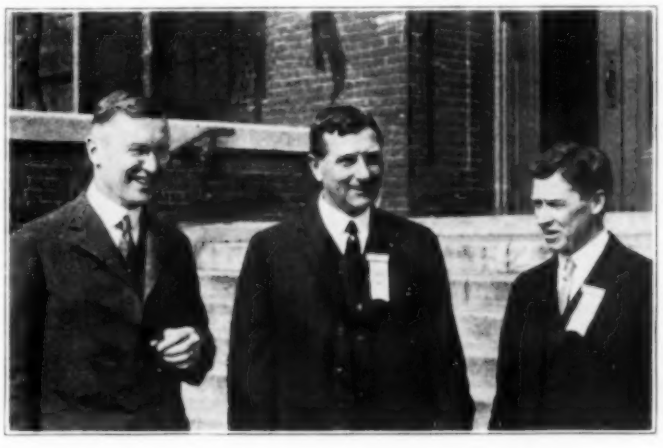
Published
Semimonthly

CLEVELAND, OHIO, NOVEMBER 1, 1924

Milwaukee Sets High Mark

Record Attendance at Exhibition and Sessions of American Foundrymen's Association and Institute of Metals Division Accompany Largest Registration in History

MILWAUKEE sustained its reputation for hospitality and cordiality, established by two previous conventions of the American Foundrymen's association held in that city, when it attracted to the 1924 technical sessions and exhibition more than 5000 registered visitors exclusive of the ladies and the host of those who attend such gatherings without formality of registration. In point of interest, the number and variety of exhibits, attendance at technical sessions, volume of inquiry for supplies and equipment, and exceptional entertainment offered by the Milwaukee convention committee, this occasion long will be remembered. Following the precedent established at Cleveland, the exhibition opened Saturday, Oct. 11. More than 4000 tickets were distributed among local foundries and manufacturing establishments. Monday marked the opening of the technical sessions and from that day until Thursday, a full program was offered, a total of 13 sessions of the American Foundrymen's association and the Institute of Metals with more than 50 highly valuable papers having been prepared under direction of R. E. Kennedy, assistant secretary.



A. B. ROOT, L. W. OLSON AND C. E. HOYT
Newly elected officers of the American Foundrymen's association oblige the local committee's movie camera man. Mr. Root is vice president, Mr. Olson president and Mr. Hoyt is re-elected secretary

The local committee, under active direction of R. J. Doty, Sivyer Steel Casting Co., and with J. J. McDevitt, chairman of the entertainment committee, provided exceptional hospitality for the visitors. Two motor trips were arranged for the ladies, one to Oconomowoc, Wis., and the other about the city occupied practically all of Tuesday and Wednesday. A theater party, at which all registrants were the guests of Milwaukee, marked Tuesday evening, and this was followed by a dancing party. Further, an informal dance was arranged by the local foundrymen to follow the annual banquet on Wednesday night. Golf was provided for all those who cared to play, and a plant visitation schedule, supplemented by informal trips at the invitation of individual foundrymen assured all the chance of becoming acquainted with Milwaukee's exceptional metal working plants. The annual banquet held at the Hotel Pfister, Wednesday, Oct. 15, was made memorable by the presentation of the Penton medal to Enrique Touceda for notable achievements in the technical phases of malleable castings manufacture and the Whiting medal to John Howe Hall for outstanding accomplishment in the metallurgy of steel castings production. These were awarded last year. In presenting the Penton medal Alfred E. Howell traced the history of the medals presented by J. S. Seaman, W. H. McFadden, J. H. Whiting and John A. Penton and paid high tribute to Mr. Touceda. Maj. R. A. Bull, past president of the A. F. A., made the presentation address in confering the Whiting medal on Mr. Hall describing the recipient's past work as worthy of special recognition.

Another step toward an international foundry convention in the United States in 1926 was taken at the business session on the afternoon of Oct. 15 when the convention adopted a resolution backing the invitation already unofficially extended by the directors and those members of the association who participated in the foreign trip in 1923.

Detroit's strong bid for the 1925 convention was stressed personally by Robert Crawford, president and general manager of the Atlas Foundry Co., Detroit, and president of the Detroit Foundrymen's association. In addition to Detroit, invitations came from Columbus, O., Atlanta, Ga., Indianapolis, Syracuse, N. Y., and Chicago, according to Secretary Hoyt.

Following the announcement of the nominating committee's recommendations for officers for the ensuing year, the retiring president, G. H. Clamer, read his report. Because of the change from a spring to a fall show this year Mr. Clamer's tenure has been nearer two years than one. He announced the sanction of the board of directors to the appointment of a subcommittee on policy, to define more clearly the scope of the association's field. Progress made in the past year by the various committees, including those on gray iron, molding sand, international relations, foundry costs, industrial education and training of apprentices, standard pattern practice, heat treatment of ferrous castings, and metallography and refractories was set forth by Mr. Clamer.

Resolutions presented by the resolutions committee, of which A. O. Backert, president of the Penton Publishing Co., Cleveland, was chairman, lauded the Milwaukee apprentice school; referred to the record attendance and the high standard of excellence of the papers, and expressed gratitude for the warmth of Milwaukee's welcome and its co-operation.

Announcement of the winners of the Penton, Whiting and Obermayer prizes was made by Secretary Hoyt. Following custom, the retiring president, G. H. Clamer, was made an honorary member of the association. Applause greeted the report of Secretary Hoyt that up to the time of the business meeting the registration, exclusive of ladies, was 4237, a mark approached only by the Columbus, O., convention of 1920, when the registration was 3897. At the present show 55,228 square feet of floor space was taken by exhibits, not quite so much as the 1920 show at Columbus, but the exhibits generally were heavier and the connected load exceeded 1100 horsepower, a new high record.

The annual banquet, which always is the climax of the American Foundrymen's association meetings, assumed new significance this year through the presentation of the first Penton and Whiting medals. These were awarded by a board composed of seven past presidents of the association to Enrique Touceda and John Howe Hall, respectively, as was announced in THE FOUNDRY, Aug. 15, 1923.

In presenting the medal to Mr. Touceda, Alfred E. Howell, past president and director of the association, paid high tribute to the donors of the Seaman, McFadden, Whiting and Penton medals and their service in making the awards an incentive to higher accomplishment. Maj. R. A. Bull in presenting the Whiting medal to Mr. Hall dwelt upon the unselfish character of the service Mr. Hall has rendered to the steel castings industry.

In his response Mr. Hall commented

GUILLIAM H. CLAMER, the retiring president of the American Foundrymen's association, has been elected a director of the association for a three year term. In accordance with the usual custom he also has been elected to honorary membership in the association. Mr. Clamer is president of the Ajax Metal Co., Philadelphia. He was born in that city in 1877 and was graduated from the University of Pennsylvania in 1897. Mr. Clamer entered the employ of the Ajax Metal Co. and during the intervening years has advanced from the position of chemist to president of the company. He is also president of the Ajax Electrothermic Corp. In acknowledgment of work done by him in nonferrous foundry chemistry and metallography, the Eliott-Cresson gold medal has been conferred upon him. He is past president of the American Society for Testing Materials.

RUPERT A. NOURSE, vice president and general manager, the Stowell Co., Milwaukee, was graduated from Drake university, Des Moines, Ia., in 1895. He taught six years and in 1901 joined the Racine Steel & Iron Mfg. Co., Racine, Wis., as office manager. In 1904 he joined the Stowell Mfg. & Foundry Co., South Milwaukee, as sales manager, shortly afterward being appointed secretary of the company and later elected vice president. In 1916 a reorganization of the company was effected and the corporate name changed to the Stowell Co. Mr. Nourse was appointed vice president and general manager. In 1912 he helped to organize the Line Material Co., South Milwaukee. In 1911 he purchased the controlling interest in the Schartow Mfg. Co., Racine, and was elected president. This corporation now known as the Midland Co. is located in South Milwaukee.

V. E. MINICH, president, the American Foundry Equipment Co., New York, has been elected a director of the American Foundrymen's association to serve for one year. Mr. Minich was born in Bucyrus, O., Aug. 28, 1867, moving to Kansas with his parents at an early age where his boyhood was spent on a farm. At the age of 21 he began his business career by selling books and since that time has held a number of important positions as sales and advertising manager. In 1908 he entered the foundry field selling sand cutting machines. At the present time he is selling and manufacturing sand cutters, sandblast equipment, etc. Mr. Minich is a member of the board of directors of the American Foundrymen's association, a past president of the Foundry Equipment Manufacturers' association, and is actively engaged in fostering the best improvements in the foundry industry.

upon the progress of the past 25 years and credited it solely to the free interchange of ideas among steel foundrymen. Soon after completing college, he had been called a foolish young man for suggesting that a 1000-pound steel casting could be quenched, while today much larger castings are heat treated successfully, steel is cast with a tensile strength of 100,000 pounds per square inch, and cast steel anchor chains serve our largest ships.

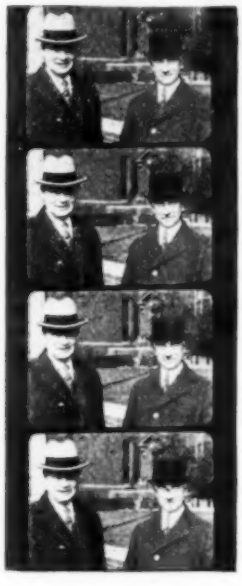
H. Cole Estep, chairman of the committee on international relations read a telegram of cordial felicitation from Emil Ramas, president, Association de Technique de Fonderie of France, and the response prepared in the name of the American Foundrymen's association.

The total registration including Wednesday was announced as 5031, exceeding by more than a thousand the previous high record for the conventions of the association. Dr. G. W. Dyer, Vanderbilt university, Nashville, Tenn., delivered an address, stressing the need for conserving constitutional government and the obligation of business men to assume more of the burdens of political life and serve in public office.

Two Sand Sessions Focus Interest

INCREASING recognition of the importance of a close knowledge of molding and core sand was indicated at the two consecutive sessions devoted to this subject which were the most largely attended of any of the many sessions on the program. More than 400 were present at one time.

Reports presented and papers read showed that the various committees and independent investigators had covered a wide field during the past year and also indicated the almost limitless territory



Director V. E. Minich and Past President G. H. Clamer

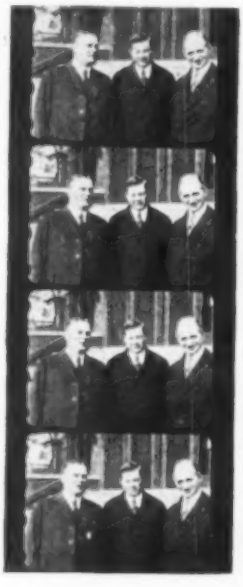
which still remains to be explored. The reports of the chairman of the joint committee on molding sand research, the sub-committee of tests, and of the sub-committee on geological survey developed some interesting points on the amount of data that is available to the foundry industry. For example the United States geological survey has compiled a list of all the sand deposits in the country, including those that are worked and those that have not yet been exploited. The data shows the location, railroad facilities, estimated available supply, grade and quality of the sand and the topography of the district in which each deposit is located.

T. C. Adams, Cornell university, Ithaca, N. Y., described the development of permeability testing apparatus and then drew a comparison between the various devices and their method of application. This paper was amplified by a paper presented by H. W. Dietert, U. S. Radiator Corp., Detroit, in which the author presented his views on the commercial application of sand testing.

Two papers embodied the results of experiments conducted by R. F. Harrington, W. L. MacComb and H. A. Hosmer, Hunt-Spiller Manufacturing Co., Boston. The first paper dealt with the effect of heat on the clay content of molding sand as shown by the dye adsorption test. The second was a logical sequel from a commercial standpoint and represented a study of various molding sand mixtures together with the physical properties of the molds and the castings from these molds.

C. R. Nevin, Cornell university, Ithaca, N. Y., also presented two papers, one showing the relation of water to bond and permeability and the other notes on the grading of sands according to grain size and bond.

Physical properties of foundry sands formed the subject of a paper presented by C. A. Hansen, General Electric Co., Schenectady, N. Y. The paper covered the result of an investigation carried to correlate most of the measurable properties of a few simple foundry sands on the principle that an intimate knowledge of a few sands is more useful than a heterogeneous collection of isolated data covering a great many sands. The following properties were studied: Green bond (Doty test), green compression strength, dry cross bending and dry compression strength, permeability of sand both green and dry, and density of green and dry sand. After viewing the results of the various tests the author former certain opinions to the effect that the strength of sand while green is due to surface tension, it is a measure of the amount of increased water



J. D. Bird, R. S. MacPherran and David McLain, Milwaukee

surface, created by the displacement of the grains during rupture of a core. Frequently, it is confused with viscosity as in the case where organic binders are added to core sand to give them apparent strength. The strength of sand while in the green state may determine molding characteristics, but rather in the way that high green strength involves sand that will not flow laterally beneath a rammer, a condition that usually leads to the production of lumpy and scabbed castings. Strength of green sand, in the usually accepted sense, has no bearing on the ability of the sand to withstand the action of the metal. The strength of sand in the dried state furnishes a basis on which to estimate the degree to which the sand either in the green or the dried state will resist the action of

New A. F. A. Officers

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Ohio Brass Co., Mansfield, O.

Vice President

A. B. Root Jr.
Hunt-Spiller Mfg. Corp., Boston

New Directors

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American Foundry Equipment Co., New York

G. H. Clamer
Ajax Metal Co., Philadelphia

John E. Galvin
Ohio Steel Foundry, Lima, O.

A. E. Hageboeck
Frank Foundries Corp., Moline, Ill.

R. A. Nourse
Stowell Co., South Milwaukee, Wis.

Wm. J. Nugent
Nugent Steel Casting Co., Chicago

the molten metal entering the mold.

Methods by which both foundry losses and molding sand costs have been reduced approximately 50 per cent during the past year in a prominent brass foundry in the middle west were described by F. L. Wolf and A. A. Grubb, Ohio Brass Co., Mansfield, O. These results were brought about by adding comparatively small amounts of an exceedingly high bond sand to reclaimed sand in the foundry. The use of local sands under careful control has reduced the freight costs incident to importing special sand from a distance. Tests taken over an extended period indicate that mulling the sand increases the bonding strength from 30 to 90 per cent. This applied to heap sand, refuse, reclaimed sand and new sand. The process closes the sand, but the original permeability may be restored without material sacrifice of bond by passing the sand through a screen or some other suitable device.

Foreign Guests

Representing the Association Technique de Fonderie de Belgique:—

M. Paul Ropsy, Antwerp
M. Jean Dumortier, Brussels
M. A. LaCroix Galler, Antwerp

Reperesenting the Association Technique de Fonderie de France:—

M. Robert Ronceray, Paris

Reperesenting the Institute of British Foundrymen:—

Mr. F. W. Bridges

Representing Australia:—

Mr. Thomas Begg, Metters, Ltd., Sydney
Mr. P. N. Davies, Davies, Baird & Robertson, Victoria
Mr. J. V. Robertson, Davies, Baird & Robertson, Victoria.

Representing Danish Foundrymen:

Mr. Svend Buaas, Aalborg, Denmark.

In the discussion which followed, the effect of mulling on other characteristics of the sand was considered and in addition new and rapid methods for measuring moisture content and tensile bond of sand were described.

E. Ronceray, Paris, France, prepared the annual exchange paper of the Association Technique de Fonderie de France. This paper described in considerable detail the principal features and method of operation of a special device which he had developed and which was shown for the first time at the international foundry exhibition held in Paris, September, 19. Briefly, the apparatus is based on the same principle as that of the Brinell machine for testing the hardness of metals. By placing the apparatus on a mold and applying sufficient pressure to bring the flange into contact with the sand, the ball is pressed on the surface by the spring with a force of one kilogram and the diameter of the ball print varies according to the density or hardness of the sand. This by the aid of tables may be calculated in terms of hardness or resistance.

New Nonferrous Alloys Are Studied

THE last previous convention of the A. F. A. and Institute of Metals division A. I. M. E. was held in Milwaukee in stirring times, just one month prior to the signing of the armistice that ended the Great War. It was a Win-the-War convention and the keynote of the nonferrous sessions was *conservation* with particular reference to the metal tin. Substitutes for tin drew forth a wealth of interesting discussions, resulting in suggestions of a more or less practical nature, many of which undoubtedly would have been followed had the war continued. In view of the remarks made at the opening session by G. H. Clamer, it would be most interesting to learn if any of these suggestions were followed. Mr. Clamer remarked "Unfortunately prior to the war no serious attention was given to the conservation of tin, notwithstanding that this country is practically dependent upon outside sources for its entire tin supply.

One outstanding feature of this year's sessions is the number of practical papers presented: A judicious mixture of the practical, technical and scientific produces a balanced program.

The first joint meeting held Monday morning was devoted to papers of a practical nature and to a journey by motion picture through the plant of the Baltimore Copper Co., Baltimore, Md. The paper by T. F. Jennings, Garfield, Utah, on making copper castings from cupola melted metal aroused great interest and will be published in full in THE FOUNDRY. The discussion brought the statement from Mr. Jennings that all the operations involved in making sound copper castings from metal melted in a cupola were fully described in the paper, nothing being omitted. The castings were machined to the extent of 40 per cent each and were found to be perfectly sound. The pouring temperature of 1950 degrees Fahr., given by Mr. Jennings, which is some 32 degrees under the melting point of copper was explained by Chairman Clamer as probably an error due to low values given by the pyrometer used.

The use of calcium chloride as a covering for the metal as tapped into the ladles was discussed by several. The author found this chemical made the best covering as it formed an air-tight film over the molten copper and adhered tightly to the ladle sides, thus excluding the air from the metal during the time of transfer from the cupola to the molds. The percentage of metal lost was not noted by Mr. Jennings, but one speaker declared that his own losses for cupola-melted metal were 1.25 per cent. George Klenk, Allis-Chalmers Co., stated his losses were around 4 per cent, but recovery from the ashes brought it down to 2.40 per cent. In view of the comparatively small losses given, it appears that cupola melting is not too expensive for general use in cases where available nonferrous melting equipment is insufficient to produce weighty castings. Mr.

Apprentice Contest

TO SHOW its appreciation of the work being done by the Milwaukee Vocational school in the foundry industry, the board of directors of the American Foundrymen's association at the recent convention in Milwaukee offered prizes to the cash value of $45 in a contest in the iron foundry of the institution. Three boys were selected from the first, second and third year apprentice class and each one was given a pattern from which to make a mold.

Three experienced foundrymen, J. J. Wilson, recently retired after many years service with the General Motors Corp.; B. D. Fuller, Defiance Paper Co., Niagara Falls, N. Y., and Pat Dwyer, engineering editor THE FOUNDRY, *were selected to act as judges. The work of the three boys in the first year class was so similar that the judges recommended that the prize be split evenly among them. In the second year class of three, the boys apparently were on a par in making the molds. A slightly superior casting won the first prize for Ben Pinkalski. The prize for the third year boys was awarded Charles Libesch. All the boys are regular apprentices in the foundry department of the Allis-Chalmers Co., Milwaukee.*

Klenk stated that using the same general methods as described in the paper he had made bronze castings weighing 30,000 pounds each. He melted the copper in the cupola and tapped onto the tin required to produce an alloy of 90 per cent copper 10 per cent tin with about 0.5 per cent phosphorus added. The tin was not all put in the bottom of the ladle, but was added in installments, one to each tapping of the copper, which is important. After the metal was all in the ladle it was stirred by a specially constructed stirrer consisting of an upright metal member having horizontal arms like a multiple cross, the arms being of differing lengths, this contrivance was both rotated and pumped with the result that analyses taken from the first metal poured and from the last were practically identical. Physical tests gave the tensile strength as over 30,000 pounds with elongation of about 15 per cent.

The annual exchange paper, "Modern Bell Founding" by Wesley Lambert and G. Hall, London, England, was read in abstract. This will appear in THE FOUNDRY in future issues.

A written discussion by C. Meneely of Troy, N. Y., was read and was largely a criticism of the use of scrap metals by the authors of the paper, Mr. Meneely contending this produced bells of inferior tons. H. Cole Estep, until recently European manager of THE FOUNDRY mentioned that in using scrap metals, the procedure was first to melt and ingot the scrap, analyze, remelt and bring to the required composition, precautions being taken to insure metal dense and free of oxide inclusions. The composition of the bell metal used by the Meneely Bell Foundry Co., was given as copper 78 per cent; tin 22 per cent.

The aluminum session held Tuesday morning was well attended. The paper on the production of aluminum pistons aroused great interest, but in the absence of the author the discussion was extended more to other classes of castings than to pistons because no one present was acquainted sufficiently with the piston industry to answer questions on the subject. The difference between pressure die castings, permanent mold castings and sand castings was defined in an elementary way.

The permanent mold is said to produce the soundest castings as the metal progressively cools from the mold to the sprue, thus the latter being the last liquid metal is admirably situated to feed deficiencies produced by shrinkage. The importance of designing and gating the molds to insure this action was stressed. However, it is important, not only in the case of permanent molds, but in sand molds also that the gates or risers should congeal last. In the case of pressure die castings, as the metal is spurted into the mold under pressure, the gate is made small, and therefore, congeals before the casting, thus cutting off the latter from any supply of reserve molten metal with the result that such castings often contain shrinkage cavities.

The pouring temperature for an alloy of 2 per cent silicon; 8 per cent copper; 90 per cent aluminum was given as about 1350 degrees Fahr., for permanent mold castings. Many difficulties have to be surmounted before perfection is attained in making such castings, and education has to be self acquired.

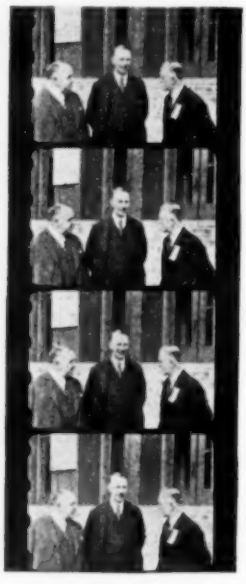
As the permanent mold method of

A. E. HAGEBOECK, secretary Frank Foundries Corp., Davenport, Ia., and Moline, Ill., was educated in the University of Chicago and graduated from the University of Iowa in 1907. He had charge of boat and barge construction on the Mississippi river with the United States engineering corps for five years. From 1912 to 1915 he had charge of the Birmingham plant of the F. J. Lewis Mfg. Co. He purchased an interest in the H. J. Frank Foundry & Machine Co., Davenport, Ia., in 1915 and spent a year at the Davenport plant. In 1916 the company built a second plant at Moline, Ill. He has taken an active part in the work of the American Foundrymen's association. He helped to organize the Quad City Foundrymen's association in 1922 and served as president for a year and a half. He is a director of the State Savings Bank & Trust Co., Moline, Ill.

JOHN E. GALVIN, president, the Ohio Steel Foundry Co., with plants at Lima, Bucyrus and Springfield, O., began his business career as a laborer on the dolomite furnace at the South Works of the Illinois Steel Co., South Chicago. At this plant he became assistant superintendent of the open-hearth department. He left there to become superintendent of the Pittsburgh Works of the American Steel Foundries, later being appointed manager of the Franklin, Pa. plant of the same company. In 1907 he helped to organize the Ohio Steel Co. He was elected vice president and built plants at Springfield and Lima, O. He has been president of the company since 1918. He is a member of the following associations: American Society of Mechanical Engineers, American Society of Mining and Metallurgical Engineers, American Society for Heat Treating, Steel Founders Society of America.

WILLIAM J. NUGENT, vice president and general manager, the Nugent Steel Castings Co., Chicago, has been connected with the foundry industry since 1902 when he became secretary to the president of the American Steel Foundries, Chicago. From 1905 to 1907 he was manager of the order department for the same company. To gain practical knowledge of the business he served a 5-year apprenticeship course at the Indiana Harbor plant of the American Steel Foundries, serving in succession as cleaning room foreman, production manager and superintendent. From 1912 to 1917 he was works manager of the Sivyer Steel Castings Co., Milwaukee. He held a similar position at the Springfield plant of the Ohio Steel Co. from 1917 to 1918. In 1918 he became associated with the Electric Steel Co., Chicago. Later the title of the company was changed to the Nugent Steel Casting Co.

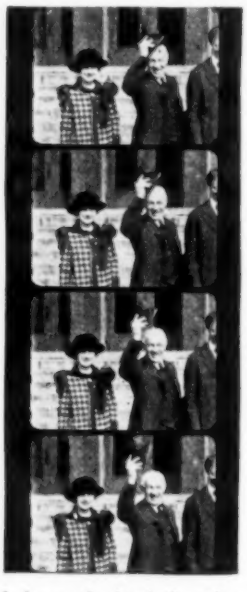
making castings saves machining work, it sometimes pays in the case of as small a number of castings as 400. In one case cited, the mold cost $400 and only 400 castings were required. Each casting cost $2, but the saving on the machine work that would have been necessary for a casting made in sand molds was such that the permanent mold was considerably more economical. A production of 50 castings a day



A. O. Backert and L. L. Anthes greet F. W. Bridges, London, England

in some cases will warrant the construction and use of a permanent mold.

As some aluminum alloys contain iron that is deliberately alloyed, and all commercial ingot aluminum contains iron, the question was asked regarding the actual amount of iron that should be added to the ingot. The answer was that a fair average of the iron content of aluminum was 0.6 per cent and accordingly one producer of such alloys was accustomed to add one-half of the amount of iron desired in the alloy. Metal melted in an iron pot takes iron from the pot, which, with the natural content present in the ingot makes an addition of half the amount wanted at the finish just about correct.



Mrs. Neal and R. F. Flintermann from Detroit

Can't See Them

EVERYONE has heard the story of the Irishman and the Scandivanian who were carrying mortar on a construction job. After an unusually strenuous period of labor, Mike jammed a pinch of tobacco into his pipe and got settled for a rest.

"Ole," he said, "I know a man what would give fifty dollars to see this buildin' when we finish it."

"Fifty dollars," queried Ole in amazement, "who would bane pay real money to see this shack? Why there's no law agin' anyone at it looking."

Deep silence for several minutes. Then curiosity overcame Swanson.

"Tell me, Mike, why this fellar bane give money to see this place?"

"Well if ye must know," answered Mike, "he's blind."

* * *

The sequel to this time worn tale was overheard in the corridor outside Kilbourn hall. Two oldtime foundrymen were talking. Apparently they had been having trouble obtaining the right kind of labor.

"Why do you know," said one, "I'd give fifty dollars of real American money to see a real, honest-to-goodness, hard-working, all around molder. I'd give it just to look at him for a few minutes, even if I couldn't hire him."

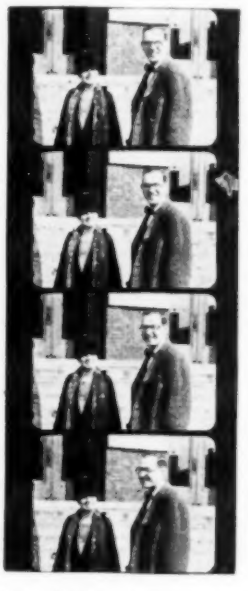
The paper dealing with silicon-aluminum sand castings by D. Basch and M. F. Sayre presented two types of these alloys, one with silicon up to 8 per cent and the other with silicon content from 8 to 15 per cent, and those alloys containing both silicon and copper may be considered a third group. Alloys with over 8 per cent silicon are likely to segregate and usually are treated with sodium or a *flux* capable of evolving sodium in contact with heated aluminum, the latter being the method devised by Dr. Aladar Pacz. A disagreement developed regarding the relative values of the two methods of modifying such silicon aluminum, one group favoring the addition of sodium in the elementary form, the other the use of fluxes, such as sodium fluoride which breaks up to a limited extent into metallic sodium and silicon fluoride. The latter group holds that the sodium acts more efficiency in the nascent state, which seems to be favored by the fact that by the latter method it is not difficult to obtain an elongation of 8 per cent with the alloy, while when sodium itself is added the elongation seems limited to around 5 per cent. The navy department specifies 25,000 pounds tensile strength and 8 per cent elongation in castings.

A theory is supposed to have been evolved by some metallurgists to account for the important changes in the structure of the higher silicon aluminum alloys produced by the presence of sodium, but this is rejected by

Everybody knows Friend Uncle Billy Chambers

others. It is highly probable the future will witness improvement of great importance in the case of the silicon aluminum alloys because of the fact that while sodium effects great improvement, it is not the logical element to use in connection with such alloys. This statement was based on the results of experimental work.

The 10 per cent, silicon alloy possesses good foundry properties and



Mrs. Flintermann and R. J. Doty vice chairman of Milwaukee committee

about 11 per cent silicon seems to be the limit for sand castings. Such alloys are useful in situations where they will be subject to salt water and to bilge water. Silicon aluminum alloys also are used in contact with oils heated to as high as 200 degrees Cent.

Antimony and bismuth were proposed as additions in place of sodium for effecting modification of the alloy. Dr. Aladar Pacz who was present during the session denied that these elements possess the least value in this connection. In his opinion there is only one method of modifying the alloy and that is the one devised by himself as the result of long and scientific investigation. Dr. Pacz mentioned that the motor housings and other parts of the dirigible ZR 3 were made of the aluminum silicon alloy. Regarding the machinability of these aluminum alloys Dr. Basch stated there is no difficulty as it is a matter of properly ground tools and experience with such alloys.

The discussion on the paper by H. C. Knerr, on aluminum alloy castings made from sheet metal scrap centered on methods of melting such material and the protection of iron melting pots from attack by molten aluminum. The best way to do such melting is to establish a bath of molten metal known as a *heel* and then dissolve therein as much of the scrap as can be dissolved, then reheat to the point where more scrap can be taken up, continuing this process until the pot is filled. The use of a sheet steel melting pot as mentioned by Knerr was information of a suprising nature, and the consensus of opinion favored the limed cast iron pot, as being much superior for this service.

Liming consists in giving the inside of the melting pot a good, unbroken coating of lime wash, and figures were presented during the discussion to show the effect of this coating in preventing the absorption of iron from the walls of the pot, by the molten aluminum. The iron content of aluminum melted in unlimed pots varies from 0.72 per cent to 1.73 per cent, while that of the same ingot melted in limed pots ranges from 0.70 per cent to 0.73 per cent.

Discuss Steel Castings

BROADENING the field for steel castings through the use of alloys and heat treating, controlled by the use of the microscope featured the technical sessions of the American Foundrymen's association, devoted to this branch of the foundry industry. A. H. Jameson, Deemer Steel Castings Co., New Castle, Del., presided at the meeting Monday afternoon. The first paper prepared by F. Groats, Holt Mfg. Co., Peoria, Ill., dealt with the heat treatment and use of alloys for steel castings. The author stated that the field for steel castings may be broadened by the use of special alloys and by suitable heat treatment and offered the proof that greater strength, resistance to shock, and wearing qualities can be obtained with small costs and practically no change in machinability. The common alloys used are those of chrome, nickel, and in some cases vanadium, and molybdenum.

Maj. Bull and A. H. Jameson of the Steel section

R. F. Flintermann, H. A. Neal and Mrs. Flintermann, Detroit

The best treatment consists in single and double annealing, quenching, and drawing.

A paper prepared jointly by J. Fletcher Harper and H. J. Steir, Allis-Chalmers Mfg. Co., Milwaukee, on the microscope as a control instrument in annealing steel castings showed that when the microstructure is satisfactory the physical tensile properties of the castings more than meet the specifications. The paper dealt briefly with the now accepted explanation of the solidification of medium carbon steels. The mechanism of primary crystallization is said to explain the weakness at corners in dirty steel castings. The secondary crystallization is considered to proceed in three ways, which causes three distinct structures in cast steel.

V. T. Malcolm read a paper on the heat treatment of steel valves castings in the electric furnace which had been prepared by him in conjunction with A. Sproat, Chapman Valve Co., Indian Orchard, Mass. It was shown by tables and charts that steel castings properly heat treated will possess physical characteristics comparable to forgings. Great stress was laid on the melting of the steel for the reason that defects are more pronounced in castings and foreign inclusions have a great effect upon their strength due to the segregation of ferrite. The rate of cooling after pouring and the pouring temperature have marked effects upon the casting on account of the tendency towards the formation of dendrites.

Mr. and Mrs. Fischer of Parsons, Kans.

An outstanding feature of the Tuesday morning steel session was the paper by T. S. Quinn, Lebanon Steel Foundry, Lebanon, Pa., entitled: "Notes, Including Conversion Cost Data, on the Performance of Two Ton Electric Steel Furnaces." The author gives data covering a period of two years operation of two 2-ton Heroult, acid-lined furnaces, and the cost of conversion per ton of steel in the ladle by months over that period of time. From the data thus compiled, charts are given showing graphically the effect of variation in furnace operation on certain factors such as combination of furnaces and cycles, and effect of these upon cost when operating under the usual two part power contract with a demand and energy charge. All the data and cost figures submitted were taken from the operating records without alterations or modifications. The steel foundry studied, manufactures small steel castings and is affected by

fluctuations in production that occur simultaneously with the high and low points of production.

In discussing this paper W. J. Priestly, metallurgical engineer, Pittsburgh, emphasized the need of keeping the manganese high as it helped to eliminate the harmful effects of sulphur. He further discussed the relative proportions of silicon and phosphorus in molten steel.

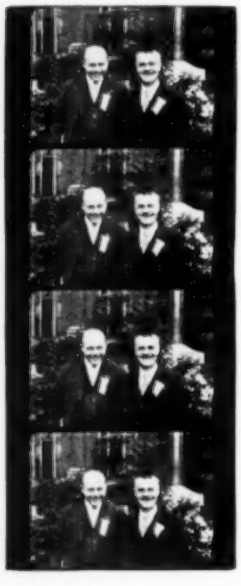
S. C. Nelson said that low silicon increases the power consumption because the molten metal becomes pasty and with high silicon the metal flows freely.

Charles W. Heywood, Burnside Steel Co., Chicago, presented a paper on the organization and practice in a steel foundry finshing department. The author explained that such a department is manned entirely by common or semi-skilled labor and the efficiency with which it is run depends on skilled direction and management. The gang system, in the authors opinion, produces the most satisfactory results from the standpoint of output and costs. Where the gang system is not feasible, another plan is to employ a pacemaker. The layout of equipment has much to do with the best routing and these two features were discussed in detail. The author further stated that the best inspection is secured when every operator is trained to inspect his own work with the foreman acting as final judge if castings are to be rejected. After the reading of this paper an animated discussion arose as to the relative values of the *gang system* and *time study* system applied to the foundry.

Dr. Ancel St. John, New York, presented a paper on the use of the X-ray in the foundry. He gave a brief description of its use for examining castings, and what it discloses together with a consideration of the circumstances under which its use is justified. The author explained that the X-rays used for examining castings usually are produced with the Coolidge type of X-ray tube. The most powerful outfit now in use is said to be situated at the Watertown arsenal and it works regularly at 195,999 volts. The author explained how the X-rays can be of service to foundrymen in two ways: to co-ordinate the work of the designing room and foundry, and for routine inspection of castings where much expensive work subsequently is to be done on the casting.

Apprentice Training Plans Shown

THAT the problem of apprenticeship training takes on special significance now because of the ban on immigration was emphasized at the Tuesday morning session of which H. S. Falk, Falk Corp., Milwaukee, was chairman. The subject of foundry training was introduced through the medium of five papers by a number of prominent and interested Milwaukee foundrymen and educators



Representing the Indianapolis Gang

who are identified with the apprenticeship system in that city. H. A. Frommelt, Falk Corp., Milwaukee, read a paper prepared by R. J. Doty, Sivyer Steel Castings Co., Milwaukee, entitled "The Employer's Expectation of Apprenticeship." Mr. Falk outlined the Milwaukee district program, explaining that many of the smaller foundries do not have the equipment and facilities for giving an apprentice a rounded-out experience. Therefore, the foundries co-operate so that apprentices gain their training by spending a little time in each of several plants. R. L. Cooley, director, Milwaukee vocational school, Milwaukee, delivered an inspirational address in which he traced the difference between trade and vocational schools, and explained why the latter must be relied upon to train boys for the industries.

The apprentice viewpoint was expressed by J. Edwards, an apprentice who received his training in the plants of the Falk Corp. C. Freund, apprentice supervisor of this company, gave his listeners a realistic account of his endeavor as a boy to learn a trade, and of his early realization that while most employers welcome boys who want to gain foundry experience, few of them pay any attention to the boys after they start work. He then told of the genuine satisfaction he was afforded when eventually he entered the employ of a company having a real apprentice plan. He declared he learned that apprenticeship is essentially "organized experience."

In the discussion which followed the scheduled program, Dr. Richard Moldenke, Watchung, N. J., related his experience abroad last year, stating that in France and Germany he found apprentice systems of unusual merit. He pointed to the significant fact that under the present immigration laws German molders and mechanics cannot enter this country as they once did, and that the United States therefore must train its own skilled foundry and machine shop workers. He added that the Dawes plan will give Germany a new lease of life industrially and probably will make German metal products a factor in world trade. This, he declared, is another incentive for Americans to extensively develop their apprentice systems.

Dean C. B. Connelley, Carnegie Institute of Technology, Pittsburgh, spoke in general terms on the urgent need of better training of foundry workers and complimented Milwaukee foundrymen on the success of apprenticeship in that city. He declared that manufacturers must give thought to means of restoring the dignity of labor, so that parents will co-operate in training their boys for industrial

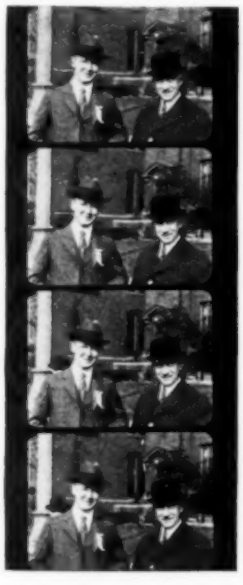
J. J. McDevitt, Chairman of Entertainment

trades. F. W. Kirby, Deere & Co., Moline, Ill., outlined briefly the start that has been made in developing an apprentice system among 27 foundries in the quad-city industrial district of Illinois and Iowa.

In reply to a question as to the possibility of organizing a vocational school in a small city, Mr. Cooley stated that Wisconsin has 53 such schools and that many of them are in cities of less than 8000 population. More than 10,000 students are enrolled in the Milwaukee school alone. He also pointed to the

Smith-Hughes act which gives federal aid to states for vocational training, providing the amount allotted by the federal government is matched by an equal amount furnished out of state, city or private funds. Many states do not take advantage of this opportunity, he declared.

L. A. Hartley, National Founders association, Chicago, outlined the efforts of that association to extend adequate foundry training to all industrial centers of the country. He stated that under the Smith-Hughes act, more than $20,000,000 will be available for vocational training in 1925. He urged manufacturers to see that this money is conserved.



A. B. Root Jr. and G. H. Clamer

Work of far reaching character and of a significant little realized by many foundrymen was reported at the Wednesday afternoon session on foundry costs, at which C. B. Connelley, Carnegie Institute of Technology, Pittsburgh presided as chairman. The report in question was that of the joint committee on pattern equipment standardization, of which the American Foundrymen's association is sponsor. In presenting a brief outline of the work that has been done, Edwin S. Carman, Osborn Mfg. Co., Cleveland, who is general chairman of the committee, expressed the opinion that $10,000,000 is being wasted annually in the use of the heterogenous mass of flasks, pattern plates and patterns in American foundries today. Much of this waste, he declared, will be eliminated when the standardized equipment proposed by the committee is adopted.

Mr. Carman exhibited four drawings showing the principle of standardization that is being employed in determining the sizes of patterns, plates and flasks. He spoke briefly of the benefits of such standardizing, stating that mounting difficulties will be almost eliminated and that patterns will fit plates and flasks in any foundry having standard equipment. Details of pattern standards are ready for publication, and additional data will be available shortly, he announced.

W. B. Greenlee, Greenlee Foundry Co., Chicago, chairman of the committee on foundry costs reported the progress being made by that committee. He reviewed the history of the association's uniform cost work and presented seven recommendations for governing the administration of cost systems.

Exhaustive papers on cost finding were presented by W. J. Corbett, Electric Steel Founders' Research group, Chicago, and H. B. May, W. K. Henderson Iron Works & Supply Co., Shreveport, La. Mr. Corbett discussed many factors entering costs and outlined a model cost system. Mr. May traced the progress made in recent years in developing foundry cost accounting methods and stressed the fact that cost systems must be based on engineering and operating considerations rather than from the accounting viewpoint.

In the discussion which followed the presentation of these papers, H. A. Neel, Michigan Steel Casting Co., Detroit, discussed the problem of accepting unprofitable work. Mr. May previously had stated that under certain conditions a foundryman is justified in assuming orders on which he knows he will not make a profit. Mr. Neel expressed the belief that the time will come when by judging every job on its own merits, no nonprofitable work will be taken. He stated that this policy protects foundry customers as much as if not more than it does the foundries.

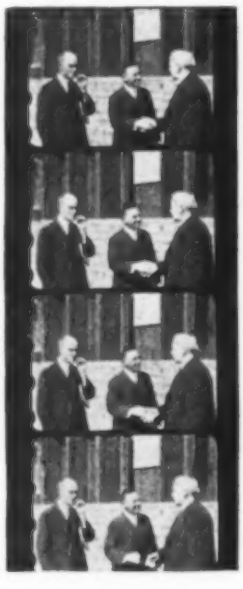
Several speakers discussed the technic of cost accounting, and warned against carrying cost finding beyond practical limitations.

Cover Malleable Iron

AN INTERESTING session on malleable cast iron was held Thursday morning with R. A. Nourse, Stowell Co., South Milwaukee, presiding. C. L. Eshleman, Griswold-Eshleman Co., Cleveland presented a paper tracing the early history of malleable iron in Europe up to the year 1826 when Seth Boyden took up the work in this country. The author referred to the secrets of manufacture in its early stages and the inferior castings produced compared with the present day product with its uniformity and high physical properties made possible by scientific research co-operation and standardization. Such a condition has enabled the industry to broaden its field of usefulness. W. R. Bean, Eastern Malleable Iron Co., Naugatuck Conn., discussed the increased soundness and superior quality of present day malleables.

A paper prepared by F. W. Wolf, technical superintendent and W. Romannoff, metallurgist. Ohio Brass Co., Mansfield, O., gave a study of the use of powdered coal in a malleable casting plant. This paper describes suitable coals to use, factors effecting powdered coal efficiency, furnace operation including skimming, rabbing and oxidation. In the authors' opinion the use of suitable coal and proper furnace design and operation powdered coal can be used in a malleable plant to advantage. In the discussion which followed the reading of this paper the cost of installation and upkeep of a pulverizing plant was brought forward especially when applied to the smaller foundries.

An interesting paper prepared by Anson Hayes, W. J. Dederichs, and H. E. Flanders, Iowa State college, Ames, Iowa, was read by Anson Hayes, The purpose of this paper is to report work done at Iowa State college which in combination with reports of work of other investigators resulted in a theory for the mechanism of complete graphitization of white iron and to report results of the application of this theory. It is stated that the precipitation of the first ferrite about the primary carbon spot is due to two factors. The carbon spot promotes the precipitation of carbon and it also acts as an inclusion to promote the separation of ferrite Eutectoid action after the ferrite envelope is completed takes place by the deposition of ferrite upon that already in the shell, which carbon is precipitated throughout, forming the small carbon spots. These carbon spots may be considered as evidence of all



Mr. Robertson and Mr. Davies of Australia greeted by Dean C. B. Connelley

eutectoid structure. The formation of the ferrite shell around the primary carbon spots produces the well known bulls eye structure. The mechanism which this paper discusses leads to the belief that complete graphitization can be brought about in much shorter time than now is required commercially.

H. A. Schwartz, National Malleable Castings Co., Cleveland, discussed a number of important points in the paper such as factors affecting carbon forms and the structural evidences of an iron carbon eutectoid. The final paper presented at this session was by Mr. Schwartz, covering the oxidation losses during air furnace melting of white cast iron. This paper primarily is a study of the composition of air furnace slags obtained under various degrees of oxidation in the oil fired furnace at the Iowa Malleable Iron Co. The bearing of these observed compositions on various hypotheses regarding the mechanism of slag formation is pointed out. Foundrymen will find valuable information in this paper regarding the loss of iron by oxidation during melting. The author suggested a method for determining the magnitude of this loss, independently of any knowledge of the weights of good and bad castings, sprue, and melting stock.

Investigate Electric Furnace Cast Iron

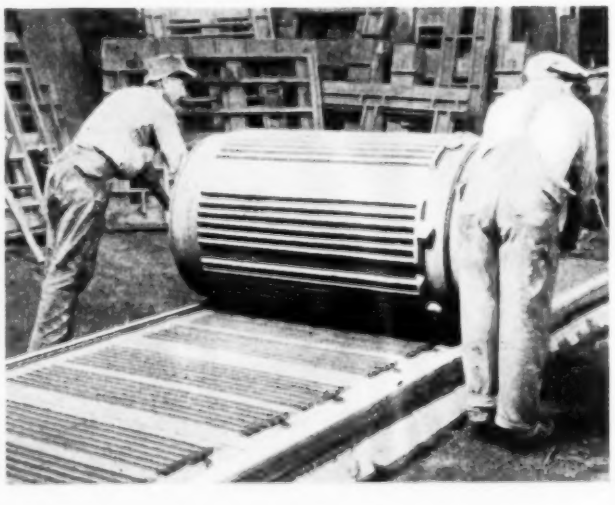
MAJOR L. L. ANTHES, Anthes Foundry, Ltd., Toronto, in his introductory remarks as chairman of the electric furnace session described the present as a transition period for the gray iron castings industry. He pointed to the improvement in quality introduced through electric furnace refining, and prophesied great progress in the next few years. G. K. Elliott, Lunkenheimer Co., Cincinnati, acted as joint chairman and introduced the discussion which followed a number of interesting papers.

E. L. Wilson, F. J. Ryan & Co., Philadelphia, in his paper, stated that melting steel scrap for gray iron is similar to melting the same material for steel castings, in the initial stages. The carbonizing agent is added to the surface of the bath. Silicon, manganese and phosphorus may be added as ferro alloys. Silicon carbide in the form of carborundum fire sand is an alternative agent to supply the silicon in some cases and has been found by the author to be efficient in raising the carbon content as well as a source of silicon cheaper than the ferro alloys in many cases, but, of course, its use is limited to the acid lined furnace. The cost of adding phosphorus as ferro phosphorus is high, as it is necessary to bring this element to 0.70 per cent to make the metal suitable for use in the foundry cupola. Current consumption on the basic lined furnace is given as 688 kilowatt hours per ton of metal, showing higher requirements than the acid process which is noted as 590 kilowatt hours.

In an able paper by James T. MacKenzie, the use of the electric furnace in the foundry of the American Cast Iron Pipe Co., Birmingham, is described. It was found desirable to melt steel scrap in the electric furnace for use in making pipe. A mixture of cupola metal with direct metal from the blast furnace was tried, the cupola metal being deoxidized and superheated in the electric furnace. Increasing cost of scrap, with a falling pig iron price together with difficulty in obtaining the right temperature for cast-iron pipe led to the abandonment of the process.

C. E. Williams, bureau of mines, Seattle, in his paper on synthetic cast iron, ascribed the term and the origination of the process to Keller, in France. Mr. Williams advises the use of an ash free carbon, such as gas or petroleum coke for raising the carbon to make gray iron from steel. Slag aids recarburization in the basic process, but is a detriment in the acid practice. Mr. Williams described the procedure in a Vancouver foundry which makes castings ranging from sash weights to piston rings of metal made from scrap in an electric furnace and at a cost only three fourths as great as cupola metal at the spout. This is due to cheap current, moderate priced scrap and on the other hand high coke and pig iron prices. The metal is dense, has satisfactory defiection, is free from sulphur, low in phosphorus and silicon and develops a tensile strength of 40,000 pounds per square inch. It has been found best to mix carbon with the charge sufficient to bring the content up to 2.5 to 3 per cent when it is placed in the cupola, and then additional carbon to meet the needs may be supplied in about

Committee Awards Obermayer Prize for 1924



Herman Honold, foundry superintendent, Blake & Knowles Works, Worthington Pump & Machinery Corp., Boston, was awarded the S. Obermayer prize for 1924 by a committee of the A. F. A., the award being made on a machine for molding gaggers and core rods. The machine consists of a cylinder with portable segments, each having a separate design of gagger or core rod. The segments are fastened by tap bolts with flush heads countersunk into the cylinder. The cylinder is made of hard wood, with cast iron, flanged wheels which operate on a standard railway-type track laid on a concrete foundation 8 inches wide at the top and set at 12 inches above the floor. To operate the machine, the bed between the tracks throughout its length is filled with riddled sand to a level surface 1 inch above the track. The bed then is scraped with a straight edge flush with the top of the track and the cylinder rolled over the bed.

20 minutes. The foundry described by Mr. Williams operates primarily on steel and melts only one charge a day of iron.

In the discussion which followed the group of papers on electric furnace iron, George Lamb, Lamb Machine Works, Hoquiam, Wash., told of running an acid steel furnace on steel scrap and producing a high quality iron. Costs are low, as the current rate is $1.25 for demand and 1 cent for consumption, and it is possible to melt the iron required in the last heat of the day with a current consumption of about 600 kilowatt hours per ton. H. B. May, W. K. Henderson Iron Works, Shreveport, La., reported difficulty in melting three or four heats a day of cast iron following steel heats. The steel heats which come after the gray iron are wild.

M. Kennedy Jr., Wm. Kennedy & Sons, Ltd., Owen Sound, Ontario, Can., told of his experience in making 4500 tons of low phosphorus gray iron in the electric furnace during the war. The low phos foundry iron needed at that time cost from $65 to $70 a ton, while the Kennedy company produced satisfactory metal at a cost of $45 a ton, using steel shell turnings.

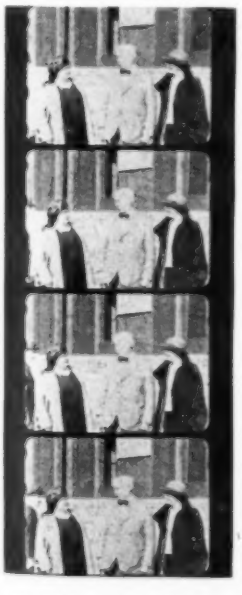
A paper by K. H. Logan, bureau of standards, Washington, described the progress of soil corrosion investigational work being conducted by the bureau in co-operation with a large number of producers of different kinds of pipe.

The committee on corrosion of ferrous metals, of which H. Y. Carson, American Cast Iron Pipe Co., Birmingham, is chairman, reported the results of accelerated spray tests on cast and malleable iron, cast steel and machine bolts. An alternate spraying and drying method is recommended as approximating conditions encountered in underground service of commodities made from these metals.

Question Gray Iron Testing Methods

METHODS of testing iron and the relative value of these tests from a practical standpoint characterized the papers and the discussion which followed at the gray iron session held in Engleman Hall on the morning of Thursday, Oct. 16, the closing day of the convention.

J. W. Bolton Niles Tool Works, Hamilton, O., presented an extensive paper on the subject of composition and structure of the standard A. S. T. M. test bar. He showed by illustrations and charts some of the effects of variation in composition and structure on the properties of the standard bar. The results obtained were compared from many angles and the author is convinced that foundrymen should continue the use of the present bar until a great deal more research data are available. He claimed that smaller bars do not show the effects of the elements as well as large bars and the effects on the larger bars depend to a great extent on the pouring temperature. He directed attention to the fact that on account of its unreliability, cast iron is regarded with little favor by engineers. While willing to admit that the methods for testing cast iron were in need of revision, he claimed that in many instances engineers submitted designs which no foundryman could meet. Silicon and carbon are the most important elements and the content of each in the iron must be considered in conjunction with the other. One affects the other. Considerable research and practical experience are required to enable a foundryman to draw deductions and determine to what extent the characteristics shown in the bar will be reproduced in the casting.



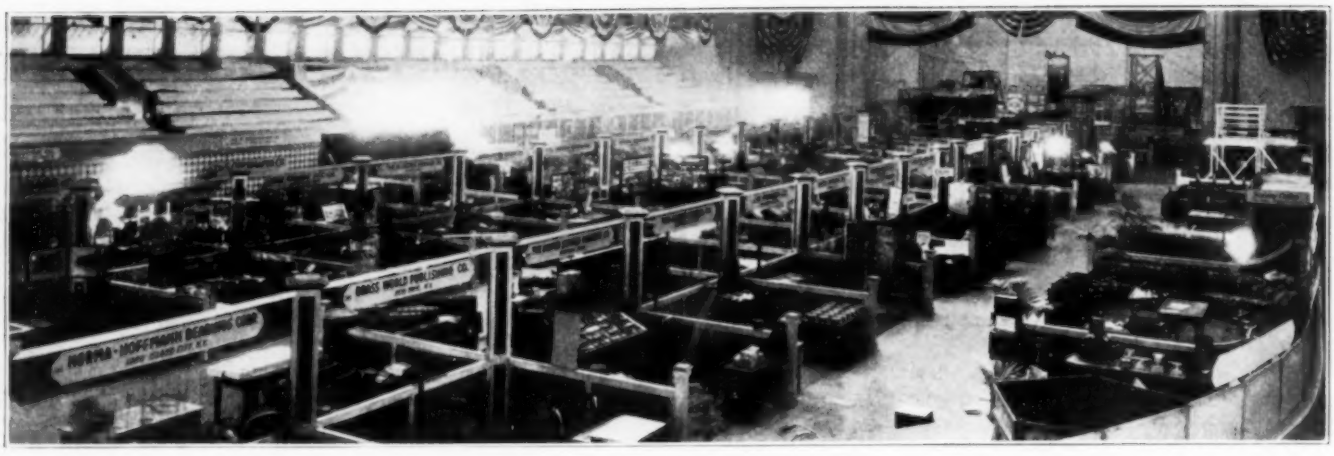
Mr. and Mrs. James Gibboney and Miss Sutton, Buffalo

M. Jean Dumortier, Paul Ropsy and A. LaCroix Galler, from Belgium

A paper presented by G. W. Gilderman, Dodge Manufacturing Co., Mishawaka, Ind., precipitated a general discussion, not only on his particular paper, "Testing Iron To Control the Properties of Castings," but also on many points brought up in the other papers presented during the session. Mr. Gilderman intimated that irregular charging methods might affect the test bars to render them worthless as guide in controlling the mixture. For example, where heavy and light scrap are charged in such a manner that all the light scrap is in a position to melt first, the iron for the test bar in one case may be caught before the heavy scrap comes down. At another time the iron may be taken at a time when the heavy scrap is in the ascendancy and the composition of the two test bars may show a wide discrepancy.

"Characteristics That Chemical Analysis Fails to Disclose in Pig Irons and Castings," the subject of a paper by W. E. Jominy, University of Michigan, brought on a discussion that centered principally around the difference in structure and the size of the graphite flakes in coke and charcoal iron. Dr. Moldenke, Watchung, N. J., pointed out that present blast furnace practice based on a desire for huge production is exerting a deleterious effect on the pig iron produced. This condition further is aggravated where large quantities of scrap is charged in the blast furnace. E. J. Lowry, Hickman Williams & Co., Cincinnati, contrasted the operation of a stack operating on charcoal fuel with one in which coke fuel is used.

H.. A.. Mackie, 1923 Obermayer Prizewinner



General View of the Main Auditorium and the Stage as the Exhibition Opened

Exhibition Crowds Auditorium

Large Number of Individual Displays of Foundry Equipment and Supplies Characterized by New Ideas—Every Available Space Occupied by Diversified Products

FOUNDRYMEN who availed themselves of the opportunity afforded by the eighteenth exhibition of foundry equipment and supplies at Milwaukee, Oct. 11, 13, 14, 15 and 16, could not but be impressed by the great variety of new ideas suggested. In molding machines, sand handling and preparation machinery, and pneumatic tools, particularly, were found many evidences of progress. An entirely new principle of molding machine operation was demonstrated. Greater interest in the foundry field was shown by producers of refractories. Equipment for the heat treatment of castings was set forth by models and photographs. New cupola charging machinery was displayed. Electrical manufacturers demonstrated motors specially designed for the rigors of foundry service. The demands of makers of intricate and delicate castings for core compounds that will meet their needs were answered by great numbers of core oil and compound producers. Alloys for highly specialized service were shown literally by the hundreds. More equipment was in operation than in previous exhibitions.

Perhaps in point of numbers of exhibitors, the 1924 Milwaukee foundry show may not go down in the industry's history as the greatest, but to the present date it never has been excelled in the variety and real value of the materials and machinery shown. More than 200 different companies chartered practically every available square foot of Milwaukee's extensive auditorium. The main hall or arena with the stage was filled. The outer hallways surrounding the arena were occupied by exhibitors' booths. The entire lower floor, dedicated to operating exhibits was crowded. Finally, Juneau and Kilbourne halls, which during the 1918 convention were given over to technical sessions, were on this occasion occupied by the commercial and manufacturing branches of the equipment and supply industry.

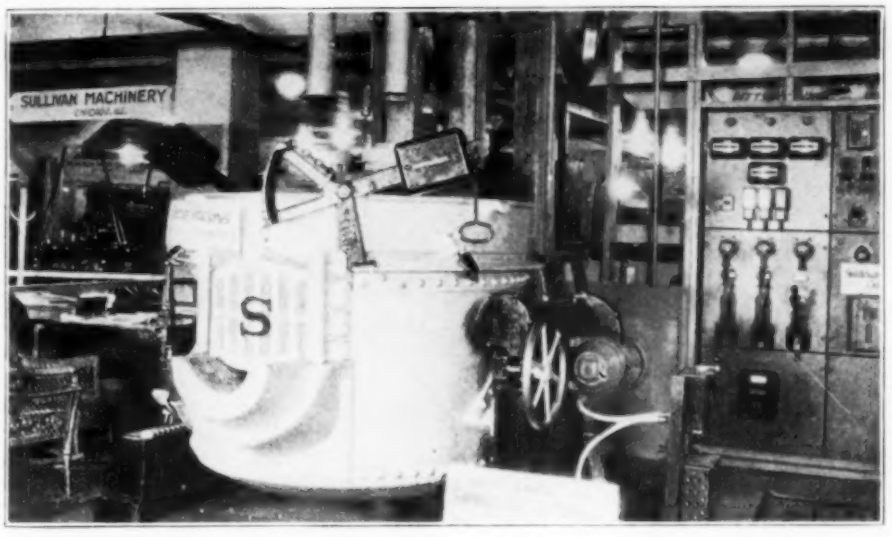
Inovations Feature Milwaukee Show

MOLDING machines in practically every model now used for the production of castings were shown by 12 firms that specialize in this branch of foundry equipment manufacture. They ranged in size and capacity from a small hand squeeze machine, designed to be used with snap flasks up to a large tractor type machine which travels back and forth on a track and which prepares the sand and then throws it into the flask with sufficient force to ram it to the required density.

This latter machine, a development of recent years was made by the Beardsley & Piper Co., Chicago and is one of a line of machines similar in design so far as the basic operations are concerned, but which differ somewhat in detail in the method of application. They are designed to meet large production problems particularly where large quantities of sand are involved. It is claimed that the largest size has a capacity which enables it to handle 400 tons of sand per day.

Probably the largest single exhibitor and one with the widest range of exhibits occupying the largest floor space was the American Foundry Equipment Co., New York. In addition to several types of molding machines this company also had on display sand cutting machines, sandblast equipment, dust arresters, snap flasks, steel adjustable jackets, pattern mounting compound, a core machine and flask bars. For demonstration purpose the sand cutting machines were shown in operation and molds were made on the molding machine.

The International Molding Machine Co., Chicago had a large assortment of molding machines both hand and power operated of the squeezer type, combination jolt stripping, combination jolt turnover machines, plain jolt machines and small machines designed especially



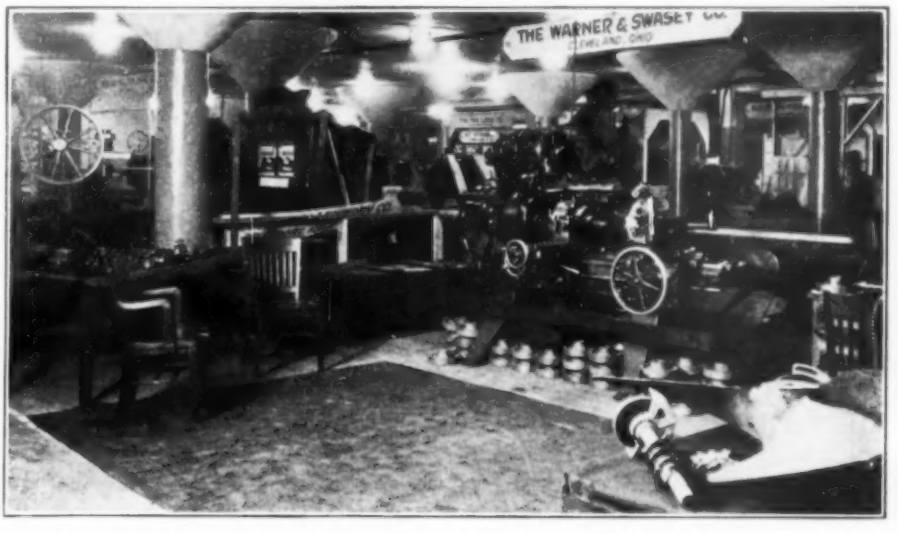
VARIOUS TYPES OF ELECTRIC FURNACES WERE SHOWN

for the production of cores. Demonstration of the various features of the machines were in progress at all times.

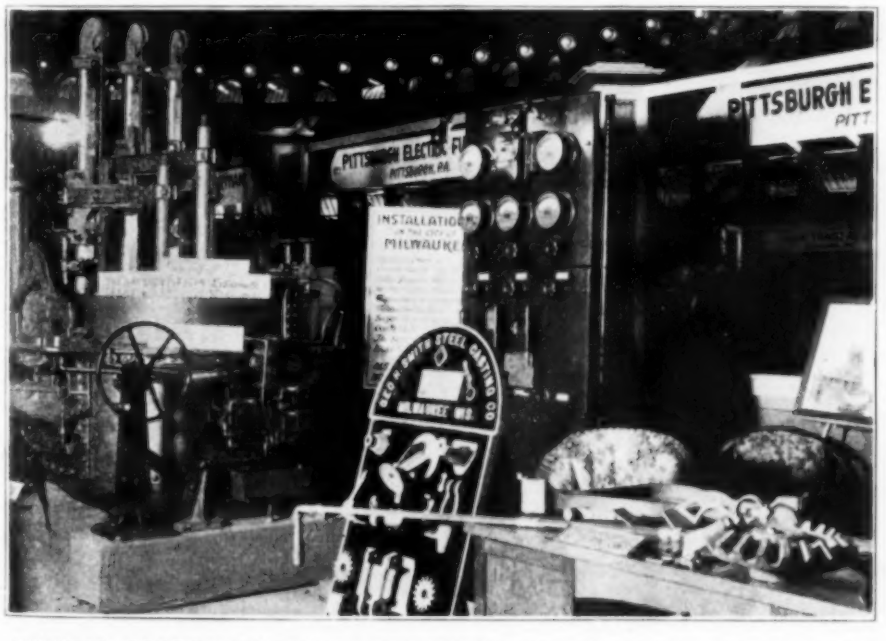
Molding machines of various types that have become fairly well standardized in their several lines were shown by the Osborn Manufacturing Co., Cleveland; Davenport Machine & Foundry Co., Davenport, Ill.; Herman Pneumatic Machine Co., Pittsburgh; Tabor Manufacturing Co., Philadelphia; Henry E. Pridmore Inc., Chicago; Arcade Manufacturing Co., Freeport, Ill.; and Johnston & Jennings Co., Cleveland.

Stoney Foundry Engineering & Equipment Co., Cleveland exhibited for the first time a molding machine that is based on a new application of the vibrator principle. The machine is operated by compressed air and while the model is susceptible to change to meet the requirements of practically any size flask, the particular machine shown was adapted to make the cylinder blocks for a popular sized car.

The absence of a large air cylinder for either jolting or squeezing the mold simplifies the construction of the machine. Four large vibrators of special design mounted vertically and with the upper ends touching the table effect the ramming. It is stated this method produces an ideal mold in that the sand is rammed hardest at the joint and progressively soft toward the back of the mold thus facilitating the escape of the steam and gas while the mold is filled with iron. The peculiar feature of the vibrator which has prevented other pioneers in their investigation along this line has been overcome in this instance by cushioning one end of the vibrator so that the impact of the piston is only



NEW TYPES OF MACHINERY AND TOOLS WERE ON DISPLAY



SEVERAL BOOTHS CONTAINED EQUIPMENT FOR COMPLETE ELECTRIC FURNACE INSTALLATIONS

delivered at the end which comes into contact with the table of the machine.

A special type of flask and bottom plate also has been developed for use with the machine. The combination eliminates the need of the usual bars in the flask and the need of any of the usual devices for clamping the bottom plate to the flask. A single bar in the center of the flask, set about 3 inches below the surface and with a single projection about 3 inches wide that extends to a point a little below the same surface serves to bind the flask in the center and also serves as an anchor to hold the bottom plate. The bottom plate in this instance really is a grating and is anchored in place by driving a long steel cotter pin above the grating and through a suitable opening in the extension to the bar.

In practice, the flask is placed on the table which also supports the half pattern. A frame 2 inches deep is placed on top of the flask to furnish the extra depth of sand required to compensate

AIR COMPRESSORS WERE EXHIBITED, SEVERAL BEING USED TO FURNISH AIR FOR OTHER EXHIBITORS

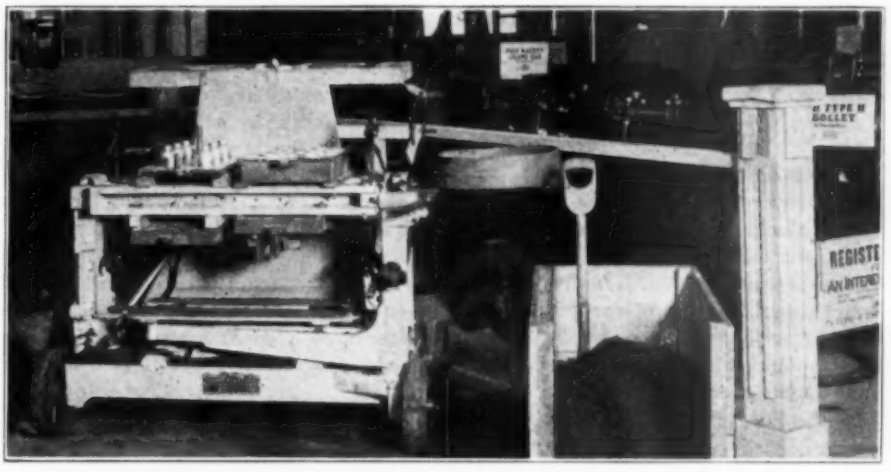
for the loss of volume incidental to packing it in the mold. The gate in a sand chute above the flask is opened and a measured quantity of sand sufficient to fill the flask falls into place. It is leveled off with a strike and then the grating which is made of aluminum to facilitate handling, is placed directly on the soft sand. It sinks a certain distance by its own weight. The vibrator valve is opened and the sand and grating sink to the proper level. The height of the frame which holds the extra amount of sand and the time the vibrator is in action are made to synchronize so that by the time the sand is rammed to the proper density, the grating will have arrived at a point where the cotter pin may be inserted. This point is determined by experiment to suit various types of flasks and patterns and once it has been determined an automatic device releases the value operating the vibrator.

An interesting adaptation of the gravity, roller conveyor was shown in connection with the exhibit of Wm. H. Nicholls Co., Inc., Brooklyn, N. Y. A long conveyor with a turn at one end extended in front of a battery of various type of squeezer and jolt machine. A short, wide conveyor was erected in front of a large combination jolt and squeeze machine designed to carry the

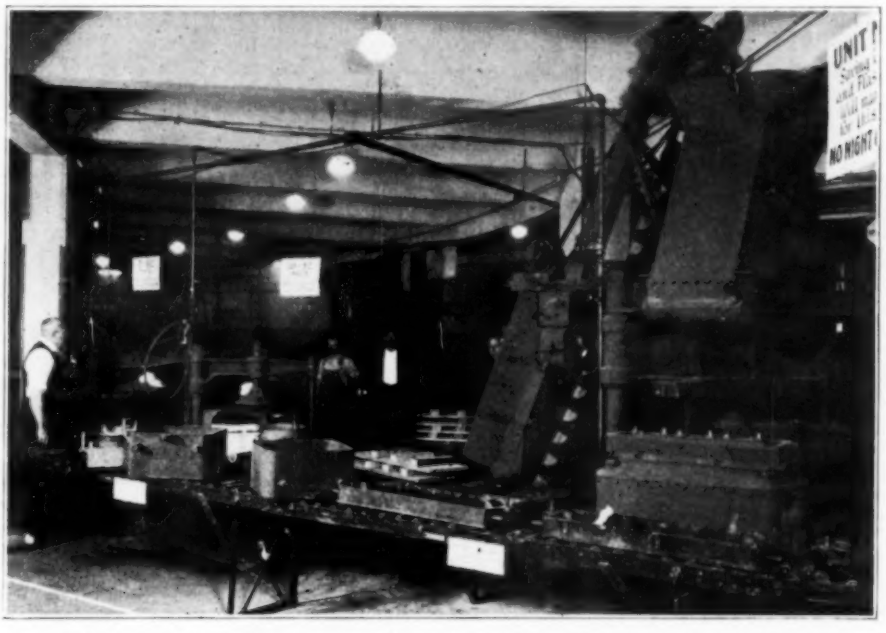
ESPECIALLY ATTRACTIVE DISPLAYS WERE ARRANGED BY SUPPLY AND CORE OIL MANUFACTURERS

completed mold to a point where it might be picked up by the crane and taken to any desired point on the floor. One machine was shown with a double pattern layout served by twin overhead sand hoppers.

Wood Bros., Thresher Co., Des Moines, Ia., had on exhibition a portable type pneumatic squeezer machine on which a split pattern was mounted on both sides of a matchplate. A half pattern was mounted on each of two matchplates with a rectangular frame between them. The frame was mounted on two swivels, one on either end. In practice a flask was placed on the top plate and filled with sand. A bottom board then was clamped in place and the entire assembly inverted. In this position the mold was squeezed from the bottom. The frame and plate were immovable and the flask was lowered on a plate which was swung to one side so that the flask might be removed. A second flask was placed on the other top plate and the performance was repeated.



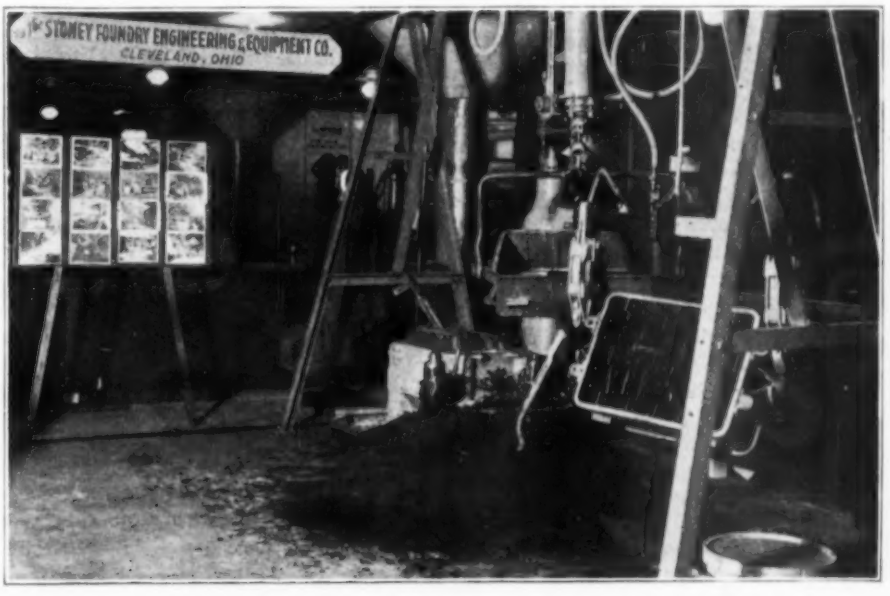
DEMONSTRATIONS WERE MADE ON MANY OF THE MOLDING MACHINES



MOLDING MACHINES AND CARRYING EQUIPMENT WERE SHOWN IN OPERATION IN MECHANICS HALL

In addition to several working exhibits of the devices which it manufactures, the Modern Pouring Device Co., Port Washington, Wis., had an extensive array of photographs showing these devices in operation in various foundries.

Sandblasting equipment, cabinet type, and rotary table in which steel shot was featured as the abrasive medium was shown in operation on the extensive area occupied by the Pangborn Corp., Hagerstown, Md. Other manufacturers engaged in this and allied lines included the W. W. Sly Manufacturing Co., Cleveland; and MacLeod Co., Cincinnati. In addition to the sandblasting equipment the W. W. Sly Co., had various types of tumbling barrels on display together with an interesting model of a dust arrester. This device was enclosed by glass on two sides so that spectators might gain a conception of its construction and the principle on which it operates. The MacLeod Co., showed a sand-blast hose machine, oil burners and a device for spraying blacking on the face of molds and cores. The Radial Sandblast Corp., New York showed a motor driven sand-blast barrel in which the abrasive entered the barrel through rows of holes from a chamber incorporated in the shell of the barrel. The Arcade Manufacturing Co., Freeport, Ill., in addition to its molding machines showed a sand-blast tumbling barrel in which a number of novel features have been incorporated. Instead of the usual cylindrical or rectangular barrel with plain flat staves or one piece sheets this device is made up of a number of corrugated staves. It is claimed that this form of construction accelerates the cleaning process by con-



NEW DEVELOPMENTS MADE IN SEVERAL TYPES OF MOLDING MACHINES ATTRACTED ATTENTION

stantly shifting the position of the castings thereby exposing fresh surfaces to the sandblast which enters through an opening at one end of the barrel.

Improve Sand Machine

Improvement in the type of sand mixing machine made by the Royer Foundry & Machine Co., Wilkesbarre, Pa., were shown in a device which contained features in addition to the original hopper, chute and revolving brush. Sand may be shoveled or dropped by a grab bucket into a long trough with a horizontal feed screw in the bottom. The sand is propelled by the screw to a point where a bucket elevator catches it and drops it into the hopper leading to the revolving steel brush which throws it in a stream through an opening in the far end of the long trough. If for any reason the sand mixture is not suitable, the opening may be closed by a shutter with the result that the sand strikes the shutter and is deflected once more into the bottom of the trough and started on a second journey through the mixer.

MATERIALS USED IN CUTTING AND WELDING WERE ON DISPLAY AT SEVERAL BOOTHS

Complete Sand Conditioning

A sand conditioning device was shown in connection with the muller type sand mixers made by the National Engineering Co., Chicago. After the sand leaves the mixer in the usual manner through the discharge gate, it is passed through the device known as an aerator. Here it impinges on a steel drum provided with a great number of projections, ½-inch in diameter and ½-inch high. This drum revolving at high speed throws the sand through the steel bristles of a stationary brush set immediately above the cylinder. The sand passes through the brush in a fluffy stream while the gravel and any other foreign material is thrown back and falls over the drum into chute that conducts it to the ground.

Skeppstedt-Erickson Co., Moline, Ill., operated two types of a new coremaking machine, or rather a machine designed primarily to secure an accurate draw from the corebox.

Core ovens in several designs were shown by Swartwout Co., Cleveland; Young Brothers Co., Detroit; F. A. Coleman Co., Cleveland and Foundry Equipment Co., Cleveland. The first had in operation a rolling drawer type oven. The second had a vertical conveyor oven, a model of a horizontal type continuous oven and a small laboratory oven. Swartwout Co., showed an electrically heated, steel insulated oven designed for the use of racks handled on lift trucks.

Foundry consultant engineering firms were represented by the Stoney Foundry Engineering & Equipment Co.; the Watson Engineering Co., New York. Their respective booths were furnished with literature and illustrations of typical foundry installations. R. W. McIlvaine Co., Chicago, and the Link-Belt Co., also of Chicago confined their display to illustrations of sand handling equipment. C. O. Bartlett & Snow Co., Cleveland had a similar display. The Link-Belt Co., also showed a revivifying apparatus together with a chain hoist. The Foundry Supplies Manufacturing Co., Chicago had an electric sand riddle in operation and also showed samples of the materials which they handle. Sand supply firms were represented by the Garden City Sand Co., Chicago; Portage Silica Sand Co., Youngstown, O.; and the Albany Sand & Supply Co., Albany, N. Y.

Warner & Swasey Co., Cleveland, demonstrated a new type of pneumatic grinder for use in grinding, buffing, polishing and cleaning. The motor has only three movable parts, consisting of a shaft assembly with motors rigidly mounted and two air operated sliding valves. The grinder weighs 15 pounds.

A radial type swing frame grinder for snagging castings and a motor driven floor grinder shown by the Bridgeport Safety Emery Wheel Co., Bridgeport, Conn., embraced a number of departures from conventional design. The head of the swing frame grinder is universal and the superstructure of the frame swings on ball bearings. A floor type buffing machine, also demonstrated by this company, was equipped with a 5-horsepower motor driving the spindle through a sprocket wheel and chain speed reducer operating in oil. Disk grinders were demonstrated by Charles H. Besley & Co., Chicago. The Marschke Mfg. Co., Indianapolis, exhibited two heavy duty foundry snaggers.

Exhibits of pneumatic tools created unusual interest this year because almost every manufacturer of this type of equipment has one or more new tools or devices. The Ingersoll-Rand Co., New York, had a new, long stroke, reversible pneumatic drill with a speed governor to prevent racing, two hoists with new devices for operating the travel by chain and by air, and a new chipping hammer designed especially for steel billets and castings. This company also operated one of the three air compressors furnishing air for other exhibits. A self contained automatic air compressor of 300 cubic feet displacement operated by the Westinghouse Traction Brake Co., Wilmerding, Pa., and an angle compound compressor running at 300 revolutions per minute at 80 pounds pressure operated by the Sullivan Machinery Co., Chicago, also supplied air to working exhibits throughout the auditorium requiring air.

Among the interesting exhibits of the Cleveland Pneumatic Tool Co., Cleveland, were ball bearing portable drills and grinders. In these machines the grooves in the crank form the inner races for the balls, while the rings on the connecting rods form the outer ball races. The rings are threaded on the crank and held in place by spring ring retainers. The cranks revolve in ball bearings. Scores of drills, grinders, rammers and hammers, core breakers, valves, nipples and other pneumatic tools and accessories contributed to the completeness of this exhibit.

New Electrical Equipment

An electric tapping machine with a mechanical reversing device, an electric screw driver for flash and pattern work, and a spring balancer capable of suspending electric and pneumatic tools up to 40 pounds in weight constituted the newer equipment of the many tools shown by the Independent Pneumatic Tool Co., Chicago. A new tanden compound electrically driven air compressor, a reamer and other tools with the crankshafts revolving in three ball bearings, and pneumatic hoists of 1000-pound

capacity completely equipped with ball bearings were among the many pieces of equipment demonstrated at the booth of the Chicago Pneumatic Tool Co., New York. Extensive exhibits of pneumatic tools were conducted by George Oldham & Son, Baltimore, and William H. Keller, Inc., Grand Haven, Mich.

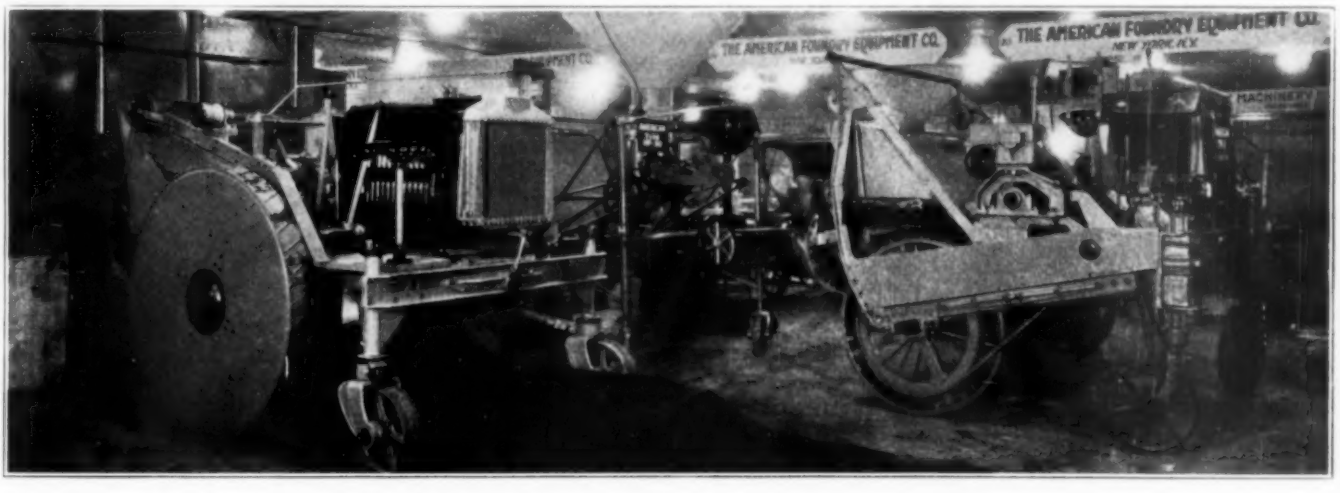
Three sizes of turbo compressors for supplying air to cupolas and for oil and gas burning furnaces were displayed by the Spencer Turbine Co., Hartford, Conn. The 1, 5 and 20-horsepower motors by which these compressors were driven effected displacements of 125, 450 and 2700 cubic feet, respectively. P. H. & F. M. Roots Co., Connersville, Ind., demonstrated a small positive displacement blower having a transparent case

Wright Mfg. Co., Lisbon, O.; the Reading Chain Block Corp., Reading, Pa.; Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.; and the Chisholm-Moore Mfg. Co., Cleveland. The Shepard company also demonstrated a cupola charging hoist in conjunction with an umbrella type pig iron bucket, a coke and scrap bucket of the same type, and a 45-inch lifting magnet. The Chisholm-Moore company operated a charging machine with a charging bucket and a magnet. P. H. & F. M. Roots Co., Connersville, Ind. had a working exhibit of a cupola charging hoist equipped with a 36-inch lifting magnet and a bucket of about 3000 pounds capacity.

Material handling equipment for operation on foundry floors was in evidence

ing beautifully decorated in celebration of the golden anniversary of the company. A new plastic blacking, sand pin, shovels and a cupola tapper and stopper were shown.

Products for use in making cores were much in evidence, consisting chiefly of various types of core binders, graphite facings, vent wax, core sand and core making machines. Many of the firms showing core binders also had on display cores made with their products by representative foundries as well as castings where this kind of core was used. Among the companies thus represented were the Werner G. Smith Co., Cleveland; Spencer Kellogg & Sons, Inc., Buffalo; the Corn Products Refining Co., New York; the Robeson



SEVERAL BOOTHS WERE DEVOTED TO THE DISPLAY OF SAND CUTTING EQUIPMENT

showing the principle of operation.

The booths of the crane and hoist builders were unusually attractive. Complete trolley assemblies for 5-ton electric traveling cranes were shown in operation by the Pawling & Harnischfeger Co. and the Milwaukee Electric Crane & Mfg. Co., Milwaukee. The first named company also showed a fully equipped crane cab and a single line grab bucket for foundry use. A 3-motor electric traveling crane of 2 tons capacity and a small trolley hoist were included in the working exhibit of the Euclid Crane & Hoist Co., Euclid, O. Trolley hoists, monorail track, hoists, etc., with a full complements of buckets, carriers, etc., made up the elaborate overhead display of the Louden Machinery Co., Fairfield Ia.

Among the many ball bearing trolleys displayed by the Richards-Wilcox Mfg. Co., Aurora, Ill., was one of ¼-ton capacity which had been operated a distance of 1100 miles with a load twice its rated capacity. Alfred Box Co., Philadelphia, demonstrated a 1-ton electric floor operated hoist, as well as other types of hoists of ½ and 1-ton capacities. Hoists also were exhibited by the

fully as much as the overhead devices. An extensive display of electric trucks and tractors was maintained by the Elwell-Parker Electric Co., Cleveland. Perhaps the most striking vehicle in this exhibit was a portable crane with a 3000-pound hoist operating from an adjustable boom having a maximum length of 19 feet. Lift trucks, elevator trucks, a furnace charger and a tractor also were shown. Tractors and trailers were displayed by the Mercury Mfg. Co., Chicago; Baker R. & L. Co., Cleveland; Clark Tructractor Co., Buchanan, Mich.; the Lewis-Shepard Co., Boston; Lakewood Engineering Co., Cleveland; and the Electric Storage Battery Co., Philadelphia. Still another type of material handling equipment was illustrated in the booth of the Mathews Conveyor Co., Ellwood City, Pa., in which several sections of a heavy duty ball bearing roller conveyor were displayed.

An exceptionally large number of exhibits were devoted to foundry supplies with the displays well diversified. Perhaps the most striking in appearance of this class was the display of the S. Obermayer Co., Chicago, the booth be-

Process Co., New York; the Chas. Krause Milling Co., Milwaukee; the Oiless Core Binder Co., Cleveland; the Patent Cereals Co., Geneva, N. Y.; the Advance Milling Co., Chicago; the Lindsay-McMillan Co., Milwaukee; the Knefler-Bates Mfg. Co., Indianapolis; H. L. Baumgartner Corp., Chicago; the J. S. McCormick Co., Pittsburgh; and the Smith Oil & Refining Co., Rockford, Ill.

A grinder and polisher, plumbago, seacoal, parting compounds buffing compounds, refractory brick and shapes and ladles were shown by Frederic B. Stevens, Inc., Detroit. Parting compounds were displayed by the Hill & Griffith Co., Cincinnati, while the Buckeye Products Co., Cincinnati, showed parting compounds, core oil and refractory cements. Graphite and plumbago facings were exhibited by the Asbury Graphite Mills, Asbury, N. J. and the United States Graphite Co., Saginaw, Mich., the latter company also showing a line of electrodes.

Various types of abrasives used in cleaning castings by the blast method were shown. The exhibit of the Globe Steel Abrasive Co., Mansfield, O., in-

cluded a high carbon chilled shot and a cornered steel grit and castings cleaned with these materials. The United States Silica Co., Chicago, showed sand-blast abrasives and an interesting display of aluminum, brass bronze and gray iron castings cleaned with its product. A feature of the display of the Portage Silica Sand Co., Youngstown, O. was a sample of conglomerate silica rock in its natural state and samples of various grades of steel molding, core and sand-blast sand.

Crucibles Displayed

Crucibles, bottom pouring crucibles, stoppers, skimming covers and nozzles were exhibited by the Joseph Dixon Crucible Co., Jersey City, N. J. while the Lava Crucible Co. of Pittsburgh, displayed a variety of crucibles, covers, refractory shapes and linings. The J. H. Gautier Co., had an extensive display of crucibles, fire brick and graphite specialties. Graphite crucibles, stoppers and nozzles were shown by the Ross-Tacony Crucible Co., Philadelphia. The Chicago Crucible Co., Chicago in addition to crucibles, showed an alloy package for making nickel and chromium additions to the cupola.

In addition to an extensive line of chaplets, the Fanner Mfg. Co., Cleveland, exhibited a number of castings cut through the sections where chaplets were used to compare the fusibility of chaplets plated with tin and copper.

Electrically operated foundry riddles were exhibited by the Great Western Mfg. Co., Leavenworth, Kans., the Vibrating Machine Co., Chicago, the Foundry Supply Mfg. Co., Chicago.

The Truscon Steel Co., Youngstown, O., showed various types of flasks, material handling boxes, core racks, bottom boards and lift truck skids, while the Sterling Wheelbarow Co., West Allis, Wis., displayed flasks, a wheelbarrow, tote boxes and special fittings for wooden flasks.

The Skybrite Co., Cleveland, demonstrated the use of its product in cleaning; the Kindt-Collins Co., Cleveland, displayed metal dowel pins and pattern letters; the Hillside Fluor Spar Mines, Chicago, has samples of lump, gravel and ground fluorspar; the C. E. McArthur Co., Chicago, displayed three types of wire straighteners and gagger making machines.

Low and high pressure burners for core and annealing ovens and a portable outfit for skin drying molds were exhibited by the Hauck Mfg. Co., Brooklyn, N. Y., while fountain fixtures for foundry washrooms were featured by the Bradley Washfountain Co., Milwaukee. The Dock & Mill Co., North Tonawanda, N. Y., had an interesting display consisting of lumber for patterns and a large log marked to show the methods of cutting into material for patterns, flasks, templates. The log weighed over 8000 pounds and was 9½ feet in circumference and 3 feet in diameter. The Standard Horse Shoe Nail Co., New Brighton, Pa., showed a new type of foundry nail and a large head chilled nail with a tapered blade.

On the arena floor the Pittsburgh Electric Furnaces Corp., Pittsburgh, displayed a ½-ton Moore type furnace, together with an exceptional collection of steel castings made in foundries of the Milwaukee district. On another portion of the same floor, the Detroit Electric Furnace Co. Detroit, set up a 250 pound, rocking type brass furnace, the operating mechanism being connected to show the movement of the unit in service. William Swindell & Bros., Pittsburgh, installed a 1000-pound melting furnace with complete switchboard equipment on the lower floor.

The Electric Heating Apparatus Co., Newark, N. J., had a small installation of an electrically operated, heat treating furnace. This was of the car-bottom type, with heating elements on four sides of the charge of castings or other parts to be annealed.

A number of improved types of electric welding apparatus were shown. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., operated an arc welding set. The company also displayed a new type of sturdily constructed motor for foundry service, heating elements employing electricity for warming such difficult locations at watchmen's shanties, crane cabs or pump houses and a new portable, electric glue pot. The General Electric Co., Schenectady, N. Y. showed portable welding apparatus, a special automatic electric welding machine using electrode wire from a reel, special control apparatus, a 2-ton hoist and its new type completely enclosed blower. The latter is designed for cupola service, and to supply blast for oil or gas burning systems. Wilson Welder & Metals Co., Hoboken, N. J., exhibited its new single arc portable type of welder, together with a variety of welding rods, flexible shaft equipment and other sundries.

The Grindle Fuel Equipment Co., Harvey, Ill. exhibited a pulverized fuel feeder, burner and blower. An exceptional variety of melting units was displayed by the Monarch Engineering & Mfg. Co., Baltimore, which had in its space crucible tilting and stationary furnaces, iron pot furnaces, a small tilting cupola, bottom pour white metal furnace together with a core oven, sand mixer and miscellaneous equipment. Holcroft & Co., Detroit, presented photographs and engineering data on furnaces for melting and annealing.

Waste recovery engaged attention from several exhibitors. The Dings Magnetic Separator Co., Milwaukee showed the operation of its magnetic separating devices for the separation of ferrous metals from waste materials or nonferrous borings and turnings.

A most complete exhibit of foundry raw materials, including pig iron, molding sands, foundry coke, aluminum and brass was offered by Rogers, Brown & Co., Cincinnati. The company also showed sample castings made from its charcoal iron. Bethlehem Steel Co., Inc., Bethlehem, Pa., featured its nickel, chromium bearing pig iron and castings produced from this metal. Pickands, Brown & Co., Chicago, arranged a frame of coke, attractively designed to set off a painting of a blast furnace plant.

Nonferrous and special metals were much in evidence. The Ajax Metal Co., in addition to ingot metals and finished castings made from its brass and bronze alloys displayed an induction type electric furnace designed to melt 600 pounds of metal per hour. Alloys & Products, Inc., New York, had an assortment of over 100 different alloys used in brass foundry practice. Metal & Thermit Co., New York, showed welding compounds and alloys and examples of their use.

Austin Co., Cleveland, constructed a a skeleton cross section of a typical foundry, showing features of engineering design, structural steel and arrangement. Typical layouts and drawings were displayed. Frank D. Chase, Inc., Chicago, offered an attractive group of photographs and plans of ideal foundries.

An unusual number of refractory producers were represented at the Milwaukee exhibition, reflecting the increasing interest in furnace linings and heat resisting materials. Carborundum Co., Niagara Falls, N. Y., and Norton Co., Worcester, Mass., displayed refractory lining shapes, special heat resisting cements and brick.

Portable Air Power

An elaborately illustrated 72 page booklet entitled "100 and 1 Ways to Save Money with Portable Air Power" has been published by the Ingersoll-Rand company, 11 Broadway, New York. It is a complete, illustrated description of portable air compressors and the many air tools and labor aiding methods made possible by them. Cost data comparing hand versus machines methods are given. It shows portable compressor uses by public service companies, municipalities, general contractors, road builders, in building construction and repair, on railways in factories, and in foundries.

Cut to this point ⟶

TYPICAL ANALYSES OF MISCELLANEOUS COMMODITIES USED IN FOUNDRY PRACTICE

By J. M. Quinn

Commodity	Calcium Carbide CaC_2	Silica SiO_2	Ferrous Oxide Fe O	Ferric Oxide Fe_2O_3	Alumina Al_2O_3	Calcium Oxide Ca O	Magnesium Oxide Mg O	Sulphur S	Phosphoric Acid P_2O_5	Manganese Oxide Mn O	Phosphorus P	Chromic Oxide Cr_2O_3	Source of Data
MISCELLANEOUS MATERIALS—(Continued)													**MISCELLANEOUS MATERIALS—(Continued)**
Acid Electric Furnace Slags — Oxidizing	.....	45.10	23.65	2.30	1.75	5.35	2.10	0.400	Trace	19.30	.....	.....	Weitlaner, *The Blast Furnace and Steel Plant*, Jan. 1922
Acid Electric Furnace Slags — Oxidizing	.....	39.02	23.80	2.15	1.92	5.80	1.50	0.150	0.200	25.41	.....	.....	Weitlaner, *The Blast Furnace and Steel Plant*, Jan. 1922
Acid Electric Furnace Slags — Reducing	.....	54.20	4.05	0.35	1.86	23.20	3.05	0.400	Trace	11.15	.....	.....	Weitlaner, *The Blast Furnace and Steel Plant*, Jan. 1922
Acid Electric Furnace Slags — Reducing	.....	52.60	3.85	.....	1.52	13.70	3.20	0.130	0.120	23.70	.....	.....	Weitlaner, *The Blast Furnace and Steel Plant*, Jan. 1922
Acid Electric Furnace Slags — Finishing	.....	58.70	3.10	.....	3.35	21.25	1.15	0.005	0.003	12.01	.....	.....	Lindemuth, *The Blast Furnace and Steel Plant*, Dec. 1919
Basic Electric Furnace Slags				Ca S									
Chrome Steel—Oxidizing	.....	9.37	9.25	.....	2.78	51.15	12.47	0.026	0.63	2.76	.....	9.32	Sisco, *Chemical and Metallurgical Engineering*, Jan. 4 1922
Chrome Steel—Finishing	3.43	10.30	0.72	2.11	2.78	65.63	10.03	.....	.....	0.11	Trace	0.05	Sisco, *Chemical and Metallurgical Engineering*, Jan. 4 1922
Plain Steel—Oxidizing	.....	20.37	17.78	.....	3.25	41.45	7.13	0.037	2.37	7.68	.....	.....	Sisco, *Chemical and Metallurgical Engineering*, Jan. 4 1922
Plain Steel—Finishing	2.86	14.03	0.50	2.85	2.96	63.71	9.65	.....	.....	0.17	.....	.....	Sisco, *Chemical and Metallurgical Engineering*, Jan. 4 1922
White Lime—Not Reducing	.....	17.57	1.33	0.87	3.12	62.45	11.65	.....	.....	0.36	.....	.....	Sisco, *Chemical and Metallurgical Engineering*, Jan. 4 1922
White Carbide—Very Reducing	4.54	7.48	0.35	2.26	2.17	65.82	13.78	.....	.....	0.05	.....	.....	Sisco, *Chemical and Metallurgical Engineering*, Jan. 4 1922
				Fe_2O_3									
Oxidizing (Black and Streaky)	.....	9.58	28.36	6.43	1.73	41.69	6.99	0.620	1.47	0.99	.....	.....	Mueller, *Chemical and Metallurgical Engineering*, Vol. 9 1911
Deoxidizing (Grayish Brown Sand)	.....	26.78	1.02	0.23	1.67	59.50	5.54	0.300	0.07	1.44	.....	.....	Mueller, *Chemical and Metallurgical Engineering*, Vol. 9 1911
Deoxidizing (White Sand)	.....	17.50	0.27	.....	1.27	69.45	5.78	0.500	0.12	0.52	.....	.....	Mueller, *Chemical and Metallurgical Engineering*, Vol. 9 1911
Deoxidizing (White Powder)	.....	13.20	0.13	.....	1.73	75.85	4.22	1.220	0.09	Trace	.....	.....	Mueller, *Chemical and Metallurgical Engineering*, Vol. 9 1911
Plain Steel—Oxidizing	.....	11.76	26.28	.....	1.57	46.95	5.22	0.430	5.34	1.13	.....	.....	Illinois Steel Company, Chicago 1910
3½% Silicon Steel—Finishing	0.16	21.02	2.51	.....	2.62	58.01	13.30	0.670	0.21	0.28	.....	.....	Illinois Steel Company, Chicago 1910
Manganese Steel—Finishing	0.48	15.58	11.80	.....	2.02	36.08	7.16	0.280	0.56	35.03	.....	.....	Illinois Steel Company, Chicago 1910
Manganese Steel													
Reducing (Dark Brown)	.....	28.02	.....	20.70		48.38		.....	.....	7.02	.....	.....	Barton—*The Iron Age*, Jan. 5 1922
Reducing (Brown)	.....	34.70	.....	16.00		49.49		.....	.....	4.45	.....	.....	Barton—*The Iron Age*, Jan. 5 1922
Reducing (Light Brown)	.....	33.50	.....	10.00		56.45		.....	.....	3.75	.....	.....	Barton—*The Iron Age*, Jan. 5 1922
Finishing (White Powder)	.....	33.60	.....	9.40		58.42		.....	.....	1.59	.....	.....	Barton—*The Iron Age*, Jan. 5 1922
Slags													
Acid Open Hearth—Oxidizing	.....	58.70	11.00	0.70	1.80	3.90	0.80	.....	.....	22.70	.....	0.20	De Mare—*The Iron Age*, June 3 1920
Acid Open Hearth—Finishing	.....	58.40	15.00	0.40	1.50	2.40	0.50	.....	.....	18.80	.....	0.20	De Mare—*The Iron Age*, June 3 1920
Acid Open Hearth—Finishing	.....	57.00	25.00	.....	3.50	6.50		.....	.....	8.00	.....	.....	Cone—*The Iron Age*, April 12 1917
Acid Open Hearth—Finishing	.....	45.80	32.10	.....	0.86	Trace		.....	.....	20.95	.....	.....	Cone—*The Iron Age*, April 12 1917
Basic Open Hearth—Oxidizing	.....	10.38	27.00	.....	0.90	48.03	9.57	.....	1.78	6.33	.....	.....	Veach—The Foundry, May 15 1921
Basic Open Hearth—Finishing	.....	10.66	26.76	.....	0.52	46.24	8.32	.....	1.19	6.62	.....	.....	Veach—The Foundry, May 15 1921
Basic Open Hearth—Finishing	.....	15.43	19.27	.....	3.66	45.02	6.37	0.031	1.80	8.12	.....	.....	Priestley—*The Iron Age*, Dec. 29 1921
			Fe							Mn			
Basic Open Hearth—Finishing Av. for yr.	.....	20.01	12.68	.....	2.04	45.80	6.24	.....	.....	6.16	0.605	.....	Illinois Steel Co., Gary, Ind. 1913
			Fe O							MnO			
Blast Furnace—Lake Ore	.....	33.70	0.32	.....	12.56	38.12	11.60	0.96	.....	.....	.....	.....	Stoughton—The Metallurgy of Iron & Steel 1911
Blast Furnace	.....	32.56	0.19	.....	11.13	47.76	4.59	2.16	.....	0.36	.....	.....	Burden Iron Works, Troy, N. Y. 1920
Basic Open Hearth (Ingot Iron)	.....	10.06	40.43	.....	2.71	32.66	6.17	.....	.....	4.21	.....	.....	Strickland—*The Blast Furnace and Steel Plant*, Jan. 1922

(*Continued on Data Sheet No. 549*)

Do not cut—Fold along this line for binding

Note—This sheet may be cut along this line and one half folded over on the other to bind in 5 x 7 inch note book.

THE FOUNDRY DATA SHEET, NOV. 1, 1924
Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Cut to this point ⟶

FACTORY ISABELLA AVE & M C R R

OFFICE & WAREHOUSE
COR. LARNED & THIRD STS.

TELEPHONE
MAIN 2476

May 9th, 1924

IN REPLY REFER TO F.B.S.

The Foundry,
Cleveland, Ohio.

Attention: Manager of Advertising Dept.

Gentlemen:

During the hurry of each day's business detail it is commendable, and you, I think have the interest of your patrons in mind to that extent, that you write a letter asking if advertising service in "The Foundry" is entirely satisfactory.

I can answer in the affirmative. To give you real proof, I enclose two telegrams, both of same date, one of which inquires for a price and if delivery can be had, and when my answer gave the desired information, then, on the same day, the other telegram brings the order.

There is indisputable evidence of the value of good advertising.

Sincerely yours,

Frederic B. Stevens

Promote International Peace

Exchange of Papers and Other Forms of International Contact Are Not Only Beneficial to the Casting Industry but Also May Be Considered an Important Factor in Promoting World Peace

BY H. COLE ESTEP

MUTUAL interest among casting manufacturers throughout the world has been quickened to an appreciable extent in the six year period which has elapsed since the armistice was signed. Not only has the foundry industry of the United States been brought into closer contact with that of Europe, but European foundrymen have become much better acquainted with each other. Everywhere there is greater unity. This happy condition is the result of efforts initiated largely by the American Foundrymen's association, which have grown into the dimensions of a world movement that easily may have an important effect on future industrial and even political history.

The significance of this great development in practical internationalism within the industry in which we are all so vitally interested is not yet fully manifested. We are participating in a movement the whole power and sweep of which as yet we have difficulty in appreciating. Almost alone among the engineering trades, foundrymen in America now have the benefit of a world outlook and worldwide connections, which offer benefits of a tangible kind. Without giving up any of our natural advantages or American characteristics we are in a position, as an industry, to make our influence felt abroad as it never has been felt before, and to absorb from the Old World much that would be beneficial to our own operations. This is what is meant by practical internationalism.

Promote Concord

We have no desire to Americanize the foundry business of Europe, nor would we consent to any Europeanizing of the activities within our national frontiers. But the channels of communication which recently have been opened up between the American Foundrymen's association and the leading European foundrymen's organizations show that there is much to be gained on both sides by closer contact and knowledge of one another's methods and technical problems.

Beyond this it is beginning to be clear that in thus serving their own ends by getting together internationally, the foundrymen of the world are contributing in no small measure to the solution of a much larger problem, the problem of promoting world peace. For peace comes of understanding and it is in the professional and business arenas that most international misunderstandings originate. Therefore the burden of promoting concord rests especially heavily on the shoulders of technical men and industrial leaders.

As Oliver Stubbs, twice president of the Institute of British Foundrymen, pointed out only a short time ago, at the Newcastle-on-Tyne convention, the political troubles of a postwar world

Paper presented at the Milwaukee convention of the American Foundrymen's association, Oct. 13-16. The author is chairman of the committee on international relations of the American Foundrymen's association.

FIG. 1—FROM THIS INTERIOR VIEW OF A HEAVY WORK FOUNDRY IN FRANCE IT WILL BE NOTED THAT MOLDS ARE MADE PRACTICALLY IN THE SAME MANNER AS THEY ARE IN AMERICAN FOUNDRIES

will not be solved until business and professional men show a greater willingness to make their influence felt and to bring their specialized knowledge to bear. "Therefore," he said, "the value of these international contacts between foundrymen reaches far beyond the confines of our own industry. We are promoting the peace of the world by getting together." To which might be added that no set of men have done more since the war along this line than the producers of castings. The development of friendship in the past six years between the foundrymen of the world has been tremendous. All nations have contributed. One of the by-products of their efforts has been to lift the foundry industry everywhere to a plane of greater importance and dignity.

From this improved situation the casting manufacturers of all countries are benefiting, indirectly and directly. The primary purpose of the American Foundrymen's association is to promote the interchange of technical information. The growth of the society and the position of influence to which it has attained is sufficient proof of the tangible value of the work it is doing. In the light of this, the usefulness of the 10 papers on practical foundry subjects which have been contributed to the proceedings of the American Foundrymen's association in the past three years by foreign authors can be judged. These papers were written by men who have the highest standing in their respective countries. These papers represent a volume of information on European foundry methods which greatly exceeds anything of the sort made available to American producers during the decade or two prior to the war.

Result of Co-operation

All this is a result of the growth of international co-operation which has been outlined briefly in the foregoing, coupled with the specific arrangements for interchanging information with European foundrymen's associations which have been perfected by the American Foundrymen's association since 1920. Further details of this exchange of papers arrangement will be given later. At present it is sufficient to point out, as further evidence of the great strides made by the foundry industry recently, that in no other branch of the engineering trades has anything of the sort been attempted, so far as the author is aware. The foundrymen of America alone are possessed of a working arrangement whereby the best European thought on the technical problems of their business is brought to their doorsteps.

Foundrymen are reaping benefits from their improved international outlook in at least two other directions. One is found in the spread of the foundry equipment exhibition idea to Europe where four displays have been held since the war. The first was in Belgium, Sept. 18 to Oct. 10, 1921, at which 80 exhibitors participated. This exhibition which included like its successors, considerable American machinery, was held in Liege and was so successful that it was continued for a week beyond the original closing date. In 1922 an international exhibition of foundry supplies and equipment was held in Birmingham, England, June 15-24, featuring the product of 120 exhibitors. Paris held the stage in 1923, when a display of 100 exhibits was held Sept. 2-16, in connection with the first postwar International Foundrymen's congress. This year one other exhibition was held in Birmingham, England, June 19-28. These foreign exhibitions, although on a smaller scale than those held by the American Foundrymen's association, possess one feature of great practical value. Representative displays from five or six different countries on both sides of the Atlantic have been included in every case thus affording the visitor a unique opportunity to study comparatively, the development of foundry equipment and machinery. Those who have not been able to attend in person have had the benefit of extensive reports in the technical press. Two or three such exhibitions, have been held in Germany since the war. No records are available of

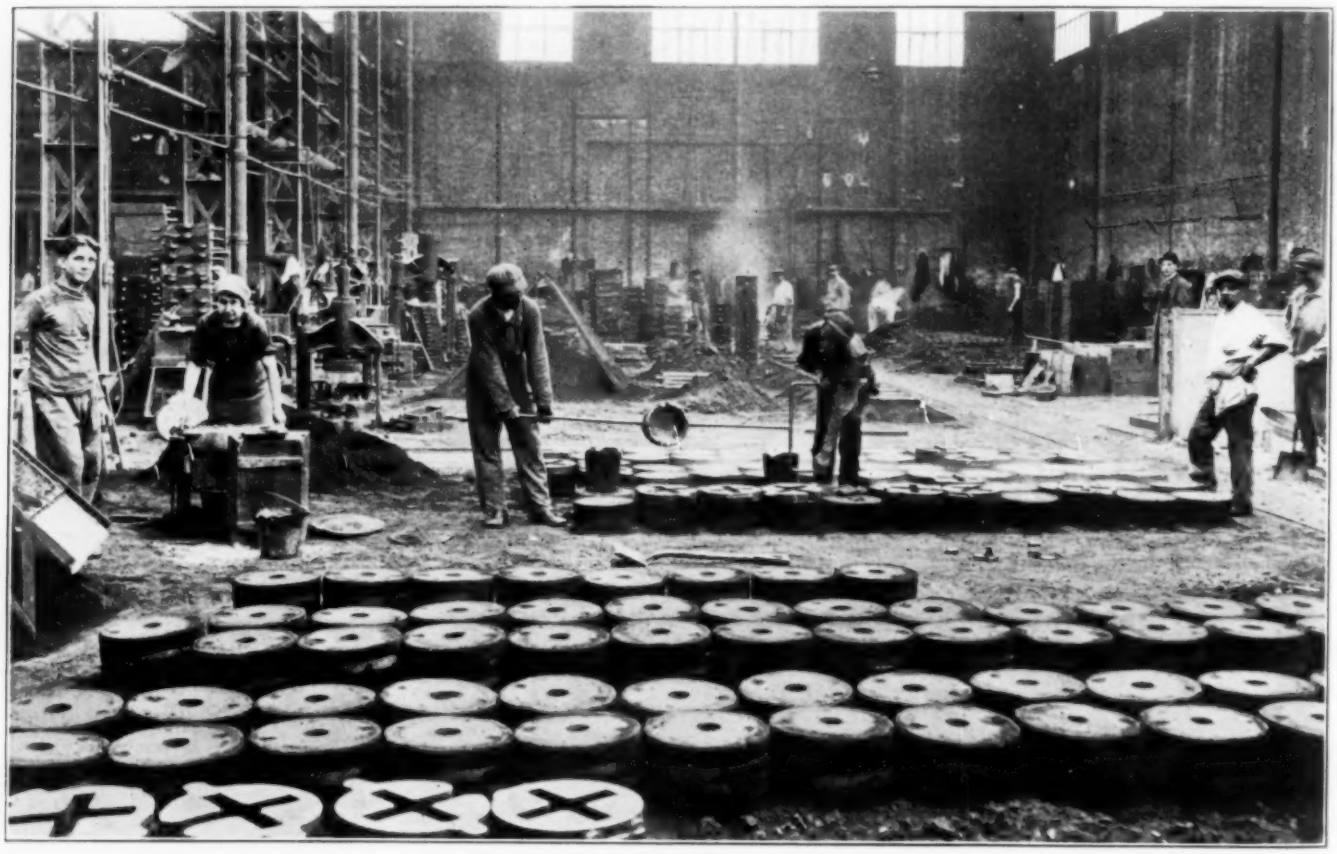


FIG. 2—INTERIOR VIEW OF A FRENCH FOUNDRY IN WHICH SMALL CASTINGS ARE MADE

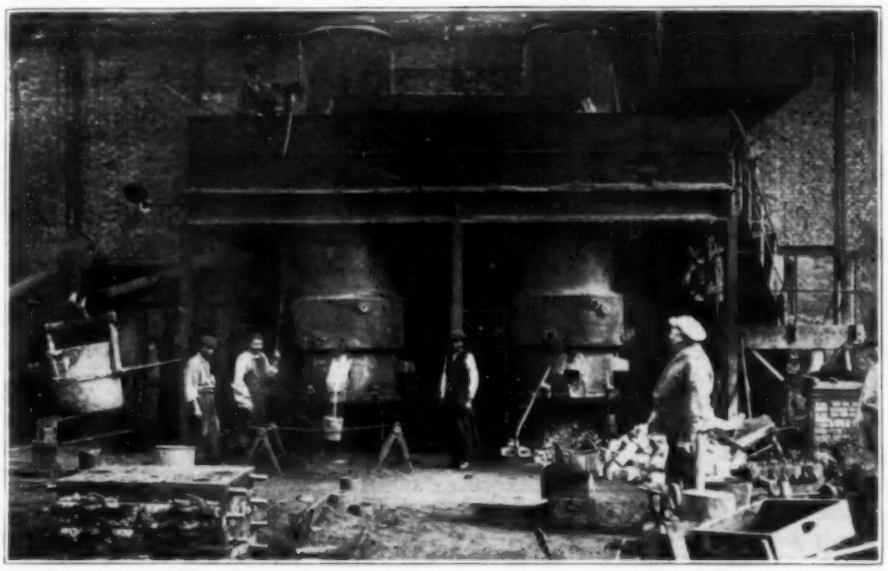


FIG. 3—CUPOLAS IN A FRENCH FOUNDRY ARE PROVIDED WITH UPPER AND LOWER SPOUTS AND ARE CONSTRICTED SHARPLY ABOVE THE CHARGING DOOR

any comparable activities in the exhibition line in the 20 years from 1894 to 1914. These displays and the stimulus they have given to mechanical and technical advancement in the foundry field are a direct result of the improved relations between foundrymen which now exist throughout the world—and in the creation of these better relations American foundrymen have played no small part.

The growth of international co-operation also has stimulated closer personal ties between the foundrymen of the various European nations and between those of the Old World and the New. There has been a healthy increase in travel back and forth. The culmination was reached at the International Foundrymen's congress in Paris last year, which was attended by a large delegation of members of the American Foundrymen's association, and the representatives of 11 other nations, leaders in the foundry industry of the world.

Where the Roots Lie Buried

In at least two directions European foundry practice has been of great service to America. We are largely indebted to Europe for our craftsmanship. European foundrymen possess an all around training which is difficult to obtain in the United States at present. This skill we have adapted and improved to suit our own conditions, but the cradle of foundry business was in northwestern Europe. Europe had skilled molders when America was still a wilderness. Cannon balls and a large iron gun were cast in London as early as 1516.

One of the earliest European foundrymen, in the commercial sense, was Dud Dudley, an Englishman who in 1619 obtained from James I a patent for the manufacture of iron castings a year before the founding of the Plymouth colony.

A little more of this history is interesting to show how the roots of the American foundry industry are buried deep in European, especially British, soil. Dud Dudley was one of the first in the world to write on foundry subjects, and his book, *Metallum Maris*, mentions various castings which he made for military and civilian purposes. Common iron castings were not produced regularly in Europe until toward the eighteenth century. About 1709 the ordinary sand mold was introduced into England as a result of the efforts of Abraham Darby, who with four partners established the Baptist Mills at Bristol. The workmen were Dutch brass founders who had learned the art of making brass castings in sand in Holland. Their first attempts with iron were failures, and considerable loss was incurred in unsuccessful experiments. Finally one night Abraham Darby, with the assistance of a young workman named John Thomas, succeeded in casting an iron pot. From that time forward iron founding grew and flourished in the British Isles, from which at an early date it was transferred to North America. Developments at this period were parallel in France, Germany, and other continental countries, from the results of which early American foundrymen profited.

Virtue in the Old

Considering the obstacles which had to be overcome in those days, by rule of thumb methods without modern scientific aids, one readily can appreciate why European foundrymen look with pride on the achievements of their forefathers. Their contention that methods and practices are not necessarily bad because they are old seems to indicate sane reasoning. There is virtue in the old as well as in the new. America has been fortunate in largely avoiding a peculiar combination of moss-grown traditions and modern ideas, the co-existence of antiquated processes and twentieth century methods which prevails in Europe. This is a product of the past and is only

FIG. 4—LACKING DEFINITE INFORMATION A SPECTATOR COULD NOT DETERMINE OFFHAND IF THIS REPRESENTS THE INTERIOR OF A FOREIGN OR AN AMERICAN FOUNDRY—IT IS AN INTERIOR VIEW OF PART OF THE HEAVY WORK BAY IN A PROMINENT ENGLISH FOUNDRY

natural in countries which were old before the United States was discovered. It may have drawbacks, but it also means that the historically inclined European foundryman can draw inspiration from a past which fairly teems with great inventions in metallurgy and shop practice from which the whole world has benefited. Participating in this source of inspiration would enable American foundrymen, along with the progressive manufacturers of castings in Europe, to create a practice combining all that is best and tried in the old with those elements which are most promising and successful in the new.

Modern Progress Abroad

Europe has not grown great merely by feeding on traditions. Her leading men, in any line of endeavor, always have been pushing ahead. American foundry practice can profit by the closer contacts we are establishing with the Old World. Great as has been our advance in research work, we might be influenced profitably in certain directions by the progress of Europe. Foreign foundry scientists are able to show us what can be done by individuals in the field of technical investigation. In both England and France a healthy spirit of individualism in research work is in evidence. Professor Turner's investigations of the effect of silicon, F. J. Cook's researches into the network phosphide-cementite eutectic in cast iron, or the Fremont-Portevin method of testing, are tangible examples which individual European foundrymen of scientific bent have tendered their American confreres.

The contacts established in the past few years have given American foundrymen equal opportunities in the field of shop practice. Along this line the work of F. W. Stokes on centrifugal castings might be cited. This process opens up a whole new vista of casting manufacture. We have also the benefit of the study of foundry sands made by Prof. P. G. H. Boswell, while in the sphere of marine engineering, in which British foundrymen admittedly are leaders, the methods of molding large propellers, etc., developed by men like Wesley Lambert have been of great value to American producers. On the other side of the channel a distinguished French foundryman, E. V. Ronceray, has given us the benefit of his work on how to make castings without feeding heads and risers, a suggestion of great value to shops where the cost of handling large quantities of metal runs into thousands of dollars a day. The influence of European foundry practice on the American industry instead of being negligible comes nearer to being profound and indicates how advisable it is for the progressive American foundryman to keep in touch with the latest European developments.

Labor Saving Equipment

The reverse is equally true. Now that it is in the full tide of manhood, the influence of American foundry practice on Europe is tremendous. This is creating new developments and tendencies in the Old World with which American producers would do well to keep in touch. Europe looks largely to the United States for the application of labor-saving foundry equipment. There is a tendency abroad to pay more attention to metallurgy than to shop practice, the latter being left more to the inherited skill of successive generations of molders. This means that the foreman in Europe occupies an exceedingly important position, left, as he is in many cases, more or less to work out his own methods. In the United States the shortage of skilled labor has forced us to develop ways of doing things by machinery, in the working out of which our large markets are a big help. We are in a position to give leads to Europe in the direction of applying machinery and the energies of technically trained men to problems of shop practice. American molding machines are found throughout the length and breadth of Europe, while many of the locally made machines show the influence of American design and inventive genius. Others, it is true, like the French hydraulic type, are decidedly original. In this category might be placed also the English electro-pneumatic machine. In general, however, America sets the pace on foundry equipment.

Naturally in the field of automotive castings the influence of American methods is felt abroad. On both sides of the ocean the specifications of automobile engineers constantly have become more exacting while the problems of molding and coring which the found-

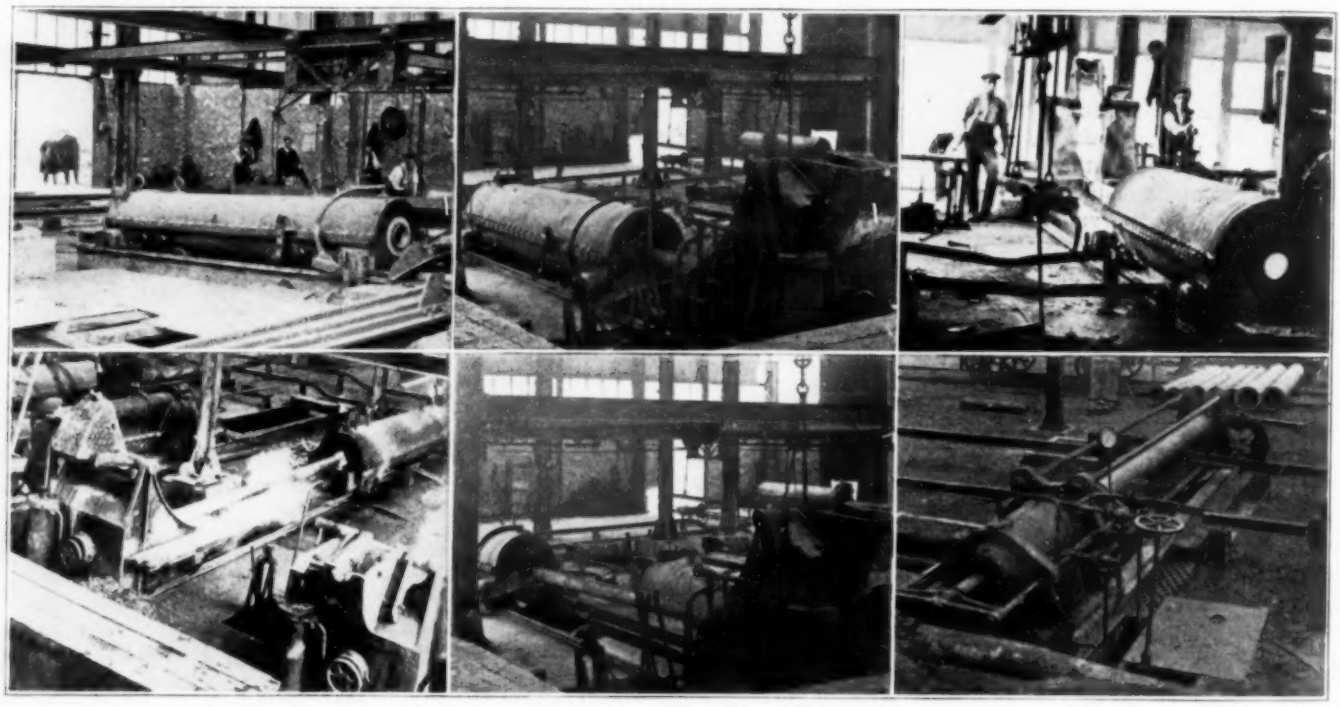


FIG. 5—CENTRIFUGAL METHOD FOR MAKING PIPE. ABOVE FROM LEFT TO RIGHT—THE MOLDING MACHINE—MACHINE READY FOR CASTING—SPINNING OPERATION—BELOW—AT THE CLOSE OF THE SPIN—MACHINE SHOWING CANTILEVER POURING TROUGH—HYDRAULIC TESTING

ryman is asked to solve are growing continuously more difficult and complicated. As a result, both in Europe and in this country, only those plants equipped and organized to turn out the highest grade of gray-iron castings have been able to make a continuous success of automobile work. To meet the requirements of this new industry specialty shops have been developed in Great Britain and on the Continent to produce motor-car and motor-cycle cylinder castings largely according to American methods, except that there is a tendency to adhere to dry-sand practice. The oil-sand core, on the other hand, has been adopted almost universally. The organization features and methods of up-to-date British automotive foundries such as those found in Smethwick and Coventry possess many features which had their origin in the United States. Near Paris a new automobile factory is under construction which will be equipped throughout almost exclusively with American machinery and appliances, especially in the foundry. In Coventry, England, the manager of an exceedingly successful piston-ring foundry sticks closely to what may be termed the American idea of following out one definite line of manufacture to the point of exhausting its possibilities.

Increase Production

A recent issue of THE FOUNDRY contained an article describing how the introduction of a certain American type of molding machine gradually is transforming the practice and methods of one of the oldest and most famous foundry centers in Scotland. Bath tubs, which a skilled molder and helper turn out at a rate of three or four per day, are being made with the help of this machine and a gang of three semiskilled men and a boy at the rate of four or five per hour. In addition to such activities, we have the influence of the practice of American-owned plants in Europe, such as the foundries of the International Harvester Co. in Lille, France, or of the Ford Motor Co., at Cork, Ireland.

American manufacturing methods are influencing European foundry practice in another direction, what may be termed the American conception of quantity production. That this is somewhat different from some European ideas of what they call mass production is evident from a superficial study of the situation. If in the next ten years America can give to Europe a true conception of what quantity production really stands for, it will be a contribution of the first magnitude to the material progress of the twentieth century. The idea that quality must go hand in hand with quantity production lies at the root of this problem. The idea persists in some European quarters, especially in the foundry field in England, that modern high speed production somehow implies a lowering of quality standards. It even is contended that these methods have all but eliminated the skilled workman and annihiliated craftsmanship, without which a superior product cannot be produced.

The American View

It is not always appreciated that what quantity production methods really imply is merely a change in the way in which craftsmanship is applied to the job. This aspect of the manufacturing problem seems to be grasped somewhat more readily on the Continent than in Great Britain, but a change of view is taking place on both sides of the channel. Gradually it is becoming evident that it is not necessary to follow slow, expensive, hand production methods to produce a quality product. Given raw materials of the proper sort coupled with methods that are right and an organization which insures the proper maintenance of standards, both as regards raw materials and process, and the result must be a satisfactory product of uniformly high quality. It is a question not of energizing but of controlling the processes of production. This is the view of America, which the writer ventures to predict will have a considerable influence on the development of European manufacturing methods, especially in the foundry field, in the next 10 or 20 years.

From the foregoing it is evident there is a great interchange of information now taking place in the engineering field between the eastern and western hemispheres. The Old World is influencing the technical development of the New and vice versa. Both sides are profiting, and there is more intercourse across the seas today than ever before. In the foundry business, therefore, the work of the American Foundrymen's association in foreign fields in conjunction with the Institute of British Foundrymen and the foundrymen's associations of Belgium, France, and other countries, is of the highest importance. Perhaps it can be ranked as one of the three or four most important things the association is doing, not only on account of its present value, but also to its future possibilities.

What A. F. A. Has Done

This work consists primarily in stimulating the interchange of information between the foundrymen of the world. In this direction the American Foundrymen's association has been a pioneer. In 1920 it entered into a formal agreement with the Institute of British Foundrymen to exchange papers each year dealing with important questions of foundry practice. The Institute of British Foundrymen will appoint one of its members to write a paper for the American Foundrymen's association dealing with some phase of British foundry practice which would be of use to the industry in the United States. Likewise the American Foundrymen's association, commissions one of its members every year to send the British association a paper covering some feature of American foundry practice that might have European application. This agreement is now in its fourth year, and the results of its working have been so satisfactory that other exchanges of papers have taken place between the American and the French and Belgian Foundrymen's associations, and between the latter and the British association.

In commenting on this agreement in his annual report, W. R. Bean, president of the American Foundrymen's association, 1920-22, said:

"The American Foundrymen's Association recently has taken the lead among the technical societies of the country in establishing an intelligent exchange of technical information with similar foreign associations by making arrangements for an annual exchange of papers with the leading foundrymen's associations of Europe. Beginning with the formal agreement completed in 1920 * * * the arrangement has now been enlarged to include * * * the associations (respectively) of Belgium and France."

Detailed to Contribute

This suggestion of the American Foundrymen's association has met with a whole hearted response abroad and the best European foundry experts have been detailed to contribute to the American Foundrymen's associatian programs. Commenting on the arrangements, the council of the Institute of British Foundrymen stated in 1922:

"We attach very much importance to the interchange of papers, and hope in the future much more progress will be made in this direction."

Accompanying this exchange of papers, and to some extent antedating it, a series of visits has contributed to the close co-operation that now prevails between European and American foundrymen. In 1919 A. O. Backert, at that time president of the American Foundrymen's association, paid an official visit to England and paved the way for much that has taken place since that time. In 1922 Oliver Stubbs, president, and Tom Firth, past president, of the Institute of British Fonudrymen visited the United States. They were followed in 1923 by Emile Ramas, who came as president of the Association Technique de Fonderie de France. There have been numerous other visitors on both

sides since the war. All this has contributed to the establishment of personal contacts of a more lasting and intimate character than ever before existed between European and American foundrymen.

Last year a party of about 40 members of the American Foundrymen's association went to Europe in a body and travelled through Great Britain, France, and Belgium, where they were officially entertained. It is doubtful if any other body of American engineers or professional men ever received such courtesies from their confreres in so many different European countries. This trip was an object lesson in understanding between nations along industrial lines, and in the importance of international contacts between representative business men. It culminated in the International Foundrymen's congress in Paris, which was organized by the French association, and in which the representatives of an even dozen countries participated. At the opening session the platform was occupied by the heads of the foundrymen's organizations of six great countries, France, Belgium, Czecho-Slovakia, Italy, Great Britain, and the United States. The general secretaries of four foundrymen's associations, the British, French, Belgian and American, also were present. It is doubtful if there ever has been a more representative world gathering of men engaged in engineering work.

As a direct result of this congress an important international committee has been set up to work out a generally acceptable method of testing cast iron. The Paris convention was indeed a great occasion in the evolution of the foundry industry, and a foretaste of what may be expected from the second International congress which is proposed for this country in 1926.

In concluding this paper, in which an effort has been made to sketch briefly the growth of international understanding among foundrymen and to indicate what it means to the industry at home and abroad, the writer feels he should return to the quoted sentiments expressed by Oliver Stubbs, expressing the larger aims that should underlie any international movement among business and professional men. As Mr. Stubbs points out, what we really are working for is the peace of the world. If this be idealism, let it stand. Surely there can be no less worthy object. We learned from the last war, if anything, that industry loses more than it ever can gain from a conflict in arms. Even on their lowest terms, the efforts which American and European foundrymen are making to understand each other, and to promote peace, concord and technical advancement, are fully justified. Taken at their highest, they represent a real contribution to human progress.

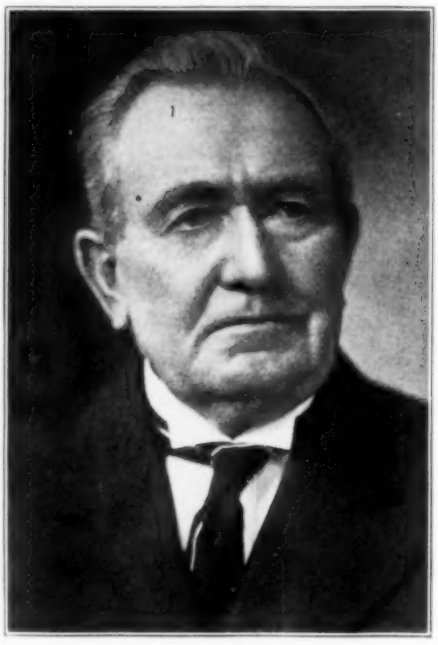
Celebrates Fiftieth Anniversary

GOLDEN anniversaries come to few individuals and in these days of strenuousity to even fewer business organizations. Therefore, it is with considerable measure of pride that the W. W. Sly Mfg. Co., Cleveland, is celebrating its fiftieth anniversary in 1924. W. W. Sly, whose genial personality, inventive genius and mechanical ability will be well remembered by old-timers, came to Cleveland drawn by a "cock-eye trace fastener" which will be remembered as the bane of existence in the days when all vehicles were horse-drawn.

As a young man, Mr. Sly had encountered difficulty when backing his team. Those fasteners, which were iron loops fastened at the end of traces and which connected the latter to the doubletree, invariably dropped free when the horses were backed against the vehicle. Mr. Sly devised a spring fastener and brought it to Cleveland to interest some of the older-day harness hardware makers. This led him to the Cleveland Malleable Iron Co., predecessor to the National Malleable & Steel Castings Co.

The manufacture of this specialty led him to become interested in nickel plating. He established a jobbing nickel plate works in 1874. This was one of the first of such plants west of New York. The demand for the nickel plated ware increased steadily supported by the growth of the stove industry and miscellaneous manufacturers. In consequence, the firm received orders from companies scattered over the entire mid-western states from the Hud on river to Milwaukee in the West.

In the old days it was customary to roll the bars used in trimming fancy stoves, to clean them before they were nickel plated. One day one of the cast iron knobs so prevalent on the old time stoves became mixed with the bars which were being rolled and Mr. Sly thus discovered the tumbling mill. His first attempt at tumbling castings was with a tub-shaped wooden barrel rotated on a vertical axis and with miscellaneous scrap as cleaning media.



W. W. SLY
Founder of the W. W. Sly Mfg. Co., Cleveland

It was found that square corners were objectionable and that although they could be handled on the buffing or cleaning machines of that day, round corners were much preferable in the tumbling barrel. This probably induced manufacturers of that day and locality to attempt the ornamental curves, swirls and rounded corners which made stoves the ornate objects that they became. The necessity for cleaning deep depressions and the difficulty of producing the pebbled surface affected by stove manufacturers as a background for the company or stove name led Mr. Sly to make the first five-pointed hard iron stars used in foundry cleaning operations.

From the dry mill, it was but a step to the wet process of preparing castings for nickel plating. One of the first, if not the first water mill was made from an old section of iron water pipe, 18 inches inside diameter and 60 inches long. Two ends were made of iron pulleys which were machined to fit and screwed in place. The early wet mills had bolts provided to hold the door in place. Later Mr. Sly devised an angle iron door recess and a quick clamping lid which was water tight and this type exists largely to the present time.

The first tumbling mills of the two types mentioned were used in Mr. Sly's own plant. Later he made some for local establishments and in 1887 he made a complete set for the Cleve-

(*Concluded on Page* 864)

Using the Electric Furnace

Company Making Cast Iron Pipe Installs Electric Melting Unit To Handle Low Grades of Iron and Scrap—Try Out Direct Metal—Segregation of Manganese Sulphide Causes Trouble

BY JAMES T. MacKENZIE

UNCERTAINTY characterized the situation in the cast iron pipe industry at the begining of 1919. The goverment suddenly had withdrawn from the market and other consumers were loath to buy at the prices prevailing at the time. In considering the situation it seemed necessary to reduce the cost to the consumer and this best could be accomplished by reducing the metal thickness of the pipe which called for an equivalent increase in the strength of the metal. The saving which could be effected was not only the actual cost of the metal in the foundry but the considerable reduction in freight which was in many cases 1/3 of the cost to the consumer.

It was necessary to increase the percentage of scrap in the mixture to accomplish the increase in strength of metal, especially with steel scrap which had the additional advantage of some $10.00 per ton in price and was available in large quantities. Other scrap such as car wheels, stove plate, etc., also was available if means could be found to employ it satisfactorily. The electric furnace had come to the front prominently as a means of converting low grade materials into a satisfactory product and it was decided to install one. This seemed to offer a solution to the problem of using direct blast furnace metal which previously had been tried and abandoned on account of difficulty of keeping it hot enough for the work. A mixture of cupola melted scrap with direct metal was especially attractive as there would be no deterioration of that portion of the mixture used direct and no melting cost to add to the price. The electric furnace offered itself as a deoxidizer for the cupola metal and as an effective superheater for the direct metal or the mixture of the two.

The American Cast Iron Pipe Co., Birmingham, Ala., installed a 6-ton Ludlum furnace and began operations with it on June 1, 1919, running on an acid bottom. For the first month the operation was simple superheating of cupola iron carrying high percentages of scrap including some 15 per cent to 30 per cent steel. This was held for 10 or 15 minutes in the furnace under a cover of cupola slag and a little coke breeze, which was usually long enough to give the slag a dark green color and the metal a temperature rather higher than was necessary. This operation was quite satisfactory, giving an iron of fairly good casting properties and high strength, the standard 1 x 2 x 26-inch bar averaging about 2,600 pounds with a deflection of about 0.40-inch.

Direct Metal Tried Out

Direct metal from a nearby furnace was introduced on July 1 using small hemispherical pots of 15 to 20-ton capacity. It may be seen readily that this metal of approximately 3.0 per cent silicon, 0.03 per cent sulphur, and 0.5 to 1.0 per cent manganese used without the losses sustained in passing through the cupola, which are higher when much steel is used would allow the use of high percentages of scrap in the cupola when used in the proportion of two parts direct to three parts cupola iron. The mixture was given about 20 minutes treatment, which was ample for deoxidation and superheating.

This operation was continued until June, 1920. There were several conditions acting against its continuance. The care and upkeep of the pots was more expensive than had been anticipated. Stock conditions at the blast furnace were not good and the metal was varying too much from cast to cast. Stocks at the local scrap yards were inadequate to enable the company to keep the correct proportion of cupola metal to direct metal. We were being forced to an excess of steel scrap to get low silicon cupola metal where we had been able to get low silicon cast scrap sufficient for the purpose when we started. This lowered the carbon too much, especially on the high silicon pots where the carbon was already low in the direct metal. The slighest mishap in cupola operation on these high steel mixtures further aggravated the condition.

The furnace then was put on a normal grey iron mixture running about 1.8 per cent silicon, 0.08 per cent sulphur, 0.4 per cent manganese, 0.7 per cent phosphorus and 3.5 per cent carbon. Cold steel was added to the cupola metal in the furnace sufficient to reduce the carbon about 0.2 per cent. This took a little more time but was much more satisfactory and easy to work. Trouble was experienced from the high freezing point of this iron. We had to pour it at 100 or 200 degrees Fahr. above that of the normal cupola iron and if we got it too hot we had trouble with cutting of the molds and cores and with segregation of manganese sulphide in the top of the casting. We tried adding ferrophosphorus to restore the fluidity, but with no appreciable results. We also tried raising the manganese but the segregation increased.

To overcome this we changed to basic bottom in December, 1920, resuming operations about Jan. 1 1921. The furnace was given the iron from only one cupola which was run on a high scrap mix of approximately 1.3 per cent silicon, 0.10 per cent sulphur, 0.3 per cent Manganese, 0.6 per cent phosphorus and 3.2 per cent carbon in the ladle. One ladle 3½ tons, of cupola iron was charged, the current turned on, and slag materials added. By the time the next ladle was ready to go in the slag was fluid and sulphur reduction had begun. The current was not interrupted for the addition of the second ladle, so by the time the third ladle from the cupola was ready the furnace was ready to tap, alloy additions having been made some three to five minutes previously. Sulphur reductions averaged about 0.04 per cent bringing the metal down to about 0.06 per cent.

The pouring range still was too narrow, in fact the sulphur reduction did not seem to help much so we tried recarburizing, first in the furnace with coke breeze and green poles, and then with blacking in the ladle. Poling was unreliable and expensive but the blacking gave a nice recovery of some 0.2 per cent carbon from 0.5 per cent charged. This widened the pouring range somewhat, but it still was too high, so after trying silicons up to 2.5 per cent, sulphurs down to 0.03 per cent, and manganese all the way from 0.3 per cent to 1.2 per cent without material relief, we abandoned the scrap mixture altogether and tried simple deoxidizing and desulphurizing

From a paper presented at the Milwaukee convention of the American Foundrymen's association. Oct. 13-16. The author is connected with the American Cast Iron Pipe Co., Birmingham, Ala.

of the regular mix. The pouring temperature still was distinctly higher after treatment than before though it was entirely possible to make remarkably tough metal with this simple treatment, 4-inch standard pipe being almost unbreakable with an eight pound hammer and the test bar giving nearly 3,000 pounds transverse strength with a deflection of nearly 0.5 inch. This operation could undoubtedly have been worked out very satisfactorily but by this time, March, 1921, the price of pig had gone down so much more than scrap that the differential was not enough to cover the cost of operating the furnace consequently the furnace was shut down on April 1, 1921.

How and Why in Brass Founding

By Charles Vickers

Casting Bronze Bushings

We have experienced considerable trouble casting bronze bushings and engine brasses which have a straight core about 3 inches in diameter running through them. Although we have looked into our sand used for molding and cores, and also the general foundry practice, we have failed to eliminate the trouble, which takes the shape of slightly porous castings. The composition of the alloy is copper 80 per cent; tin 10 per cent; lead 10 per cent, fluxed with a small amount of 15 per cent phosphor copper. Can you advise us as to the correct pouring temperature for this alloy, and what in your opinion is the cause of the porosity?

From the description given it appears as though the metal was at fault, that it contains gases which have been forced in during the melting and are held after solidification. When metal is liquified it is capable of acting similar to water in the matter of absorbing gases; thus carbon dioxide is soluble in water to a considerable extent. At ordinary temperature and pressure one measure of water will dissolve one measure of carbon dioxide. The solubility of the gas increases as the pressure on the water is increased, an example of which is furnished by seltzer water. Molten metal acts the same, it will absorb the gases produced by oxidation of carbon if brought into intimate contact with them. Fortunately, however, molten copper base alloys are naturally protected from the carbon gases, by the film that forms on their surface due to cooling and slight oxidation, otherwise, using charcoal on top of crucible melted metal would always result in porous castings.

If the metal is heated to such a high temperature that ebulition occurs, the film on its surface is broken, and it is gassed. The same thing occurs when pressure is put on the metal and it is exposed to an atmosphere of carbon gases. For the reason first stated overheating metal in a crucible gives porous castings. Metal melted electrically in a closed furnace which permits pressure to rise, in the presence of carbon gases produced by the electrodes, produces gassed castings. A natural-draft crucible furnace melts at atmospheric pressure, the carbon gases produced being heated go upward instead of down into the metal, and little difficulty is experienced getting sound castings. An electric furnace usually is filled with the same gases that fill the top of a crucible coming from the charcoal, but as there exists a shortage of oxygen, the prevailing gas will be carbon monoxide. his gas should be permitted to escape by having a liberal-sized opening, and to protect the metal as much as possible it should be covered with a blanket of calcium hydrate, or slacked lime which will absorb the carbon gases before the metal has an opportunity to do so. Attention to the melting will we believe remedy the porous condition. The pouring temperature should be around 2000 degrees Fahr., but this is not important in preventing gassed castings, with this alloy.

Strength of Cast Bronze

We are having considerable trouble casting a bronze to register a tensile strength of 50,000 pounds per square inch. We desire to obtain a formula to meet this condition. Please enlighten us.

Judging from the use of the word bronze an alloy of copper and tin, or copper, tin and zinc is desired, and if so it will be advisable to become reconciled to the thought that it will not be possible to obtain such high physical properties. The majority of brassfounders would experience great difficulty in trying to obtain over 40,000 pounds tensile strength per square in a bronze. If 50,000 pounds tensile must be met in castings, there are three different alloys that can be used: Manganese bronze; high nickel bronze and aluminum bronze.

The following alloy will meet the required specifications: copper 46 per cent; manganese copper (30 per cent manganese) 12 per cent; zinc 40 per cent, and aluminum 2 per cent. This alloy contains sufficient manganese to be entitled in the name manganese bronze.

Casting Suitable Frames for Street Lamps

We have some brass castings to make which are to be used as frames for street lamps. We want to clean them with a wire brush, and give them a dull finish with a buffing wheel. What mixture should we use for this purpose that will run well, hold its color when exposed to the weather, and be lasting? Will it be necessary to lacquer them to prevent oxidizing with time and exposure?

Two different types of yellow brass may be used for the purpose outlined. One, mixture may be low in zinc and contain lead and tin, and easy running metal. The other alloy may contain 40 per cent of zinc, and also aluminum. Without the aluminum the latter alloy will not flow easily. With the aluminum it will run any section, however, thin it may be. Its drawback is that the castings will resemble manganese bronze in color.

The first alloy mentioned is made up as follows: Copper 70 per cent; zinc 25 per cent; lead 3 per cent; tin 2 per cent. The second alloy is made up of copper 57 per cent; zinc 41 per cent; lead 2 per cent. To 100 pounds of this mitxure add 2 ounces of aluminum.

The high zinc alloy can be finished as described, but first, the castings must be sandblasted, and probably acid dipped before they are finished. The low zinc alloy has to be poured briskly to run the castings, but they can be finished as desired afterward.

Both alloys will require lacquering to preserve them in the original finish, as they will tarnish with time and exposure.

Give White Pattern Alloy

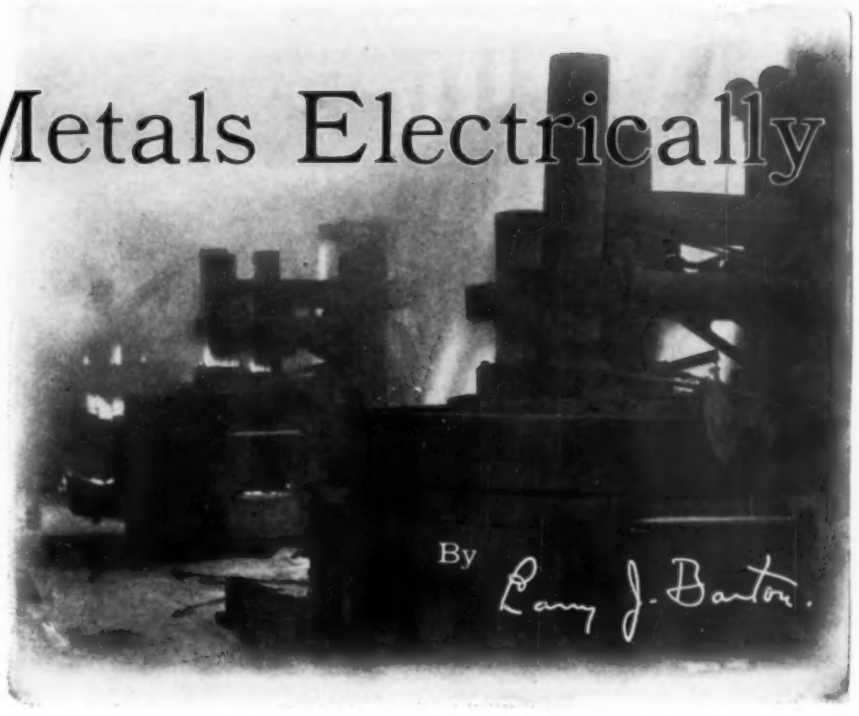
We would like to obtain a formula for a white pattern alloy, as the castings we are making for this purpose are too soft and too heavy.

A good alloy for making patterns is the following: Tin, 50.0 per cent and zinc 50.0 per cent.

Refining Metals Electrically

Chapter III (Continued)

Advantages and Methods of Using Fluorspar and Other Slags Outlined



ELIMINATION of sulphur depends upon two variables; the amount of the carbide slag present and the time held under its influence. Therefore, to save time, it is possible to eliminate a stated amount of sulphur by adding larger volumes of slag. Such a procedure is naturally an economic feature, but there are certain limits above which the slag volume should not go. This figure may be set roughly as 7 per cent of the weight of the charge lime, amounting to a total slag equivalent to about 10 per cent of the charge in weight. Any amount above this point only results in delayed and costly operation.

In the elimination of sulphur certain points must be remembered and taken into consideration. To obtain a maximum of calcium carbide in the slag, the temperatures must be kept at a high figure, consequently the depletion of sulphur in the metal proceeds rapidly and care must be taken that the metal is not heated to such a figure as would cause trouble when poured. Of course, the antidote for this is to hold the metal in the ladle a certain time before pouring the molds, a point which constitutes good practice under any condition.

Then, too, this desulphurization will not commence until the heat has been thoroughly deoxidized and cannot be forced by doping the metal too heavily with silicon and aluminum. As this power depends upon the density of the lime slag, constant additions of lime and spar will be necessary as desulphurization proceeds, to keep the slag always in a rather thick, foaming condition. The efficiency of such a slag as a deoxidizer is lowered as the sulphur percentage rises, consequently it is mandatory that both a low sulphur lime and coke should be used for these operations. The maximum amount of sulphur capable of being eliminated in this manner is probably about 0.08 to 0.12 per cent from the steel, with a slag volume not exceeding 10 per cent of the weight of metal. It is comparatively easy to reduce sulphur down to approximately 0.015 to 0.020 per cent, but to obtain lower percentages than these requires long tedious working, even though the initial sulphur was not over 0.050 per cent. However, there is no doubt but that for general purposes a steel with sulphur of not over 0.025 is as good as one with a sulphur of under 0.01 per cent so that this added desulphurization usually is not necessary nor required. In general the average amounts of sulphur eliminated by holding one hour under a perfect carbide slag will approximate from 0.020 to 0.050 per cent, depending upon the initial charge and miscellaneous conditions of refining.

Controlling the Slag

CARE is necessary in maintaining the proper consistency as well as the proper chemical constituents of the slag to secure the reactions desired. The effect of fluorspar is discussed and analyses of resulting slags are given. Constant opening and closing of furnace doors is deprecated by the author, who warns against the oxidizing effect of entering air. Additions of silicon have a tendency to thin the slag, which causes it to reflect the heat to the roof and walls, increases the deterioration of the lining and even may cause the metal to pass over to the acid side. These and other points of control are discussed in the accompanying article.

Using Fluorspar

In the early days of electric furnace melting, sand was used exclusively to thin up the slag during the finishing, but of late years this practice has been superseded in the great majority of cases by the use of either crushed or gravel fluorspar. This is a natural mineral, usually containing over 80 or 85 per cent of calcium fluoride, the remainder being silica, iron oxide, calcium carbonate, etc. It was noticed early in its use that excellent results were obtained, not only on thinning a slag, but from its ability to keep the slag strongly basic, even though thin enough to run like water. It also was noticed that when used, lower sulphurs were obtained than when it was not present, this being explained by the fact of its keeping the slag so basic.

Recently a paper on this subject appeared in *Stahl und Eisen* by S. Schleicher, which appeared in 1922. This is so important that it should be given adequate space and while the results were those obtained on open hearth work, the principles involved are directly applicable to the electric furnace and go a long way to explain certain well known phenomena. Mr. Schleicher says:

In Table XXVI are shown the results with nine heats made from material extremely low in manganese and high in sulphur and in the working of which no fluorspar was used. The last column shows the sulphur distribution coefficient and is obtained by dividing the sulphur content of the slag by that in the steel. In other words, it shows the rate of the sulphur in the slag to that in the steel.

The distribution coefficient for these nine heats averaged 3.15. Table XXVII shows what a different result is produced when fluorspar is used and given the analyses of nine, 30-ton heats, as before, using the same lime charge, but with the addition of 882 pounds of fluorspar.

The coefficient of these nine heats is considerably increased and averages 6.50. The steel of the first nine heats averages 0.08 per cent sulphur, which is above the allowable limit, while with the last nine heats it averages 0.05 per

cent. The addition of fluorspar brings about a noticeable increase in the distribution coefficient and a decrease of the sulphur in the steel.

After the addition of fluorspar; the slag becomes very fluid. If the outgoing gases are conducted through water, the well known jelly-like precipitate of silica is formed which is always produced when silicon fluoride is passed through water. The spar has therefore reacted with the silica of the slag, silicon fluoride being given off as a fume, and lime formed according to the equation:

$$2\ Ca\ Fl_2 + SiO_2 = SiFl_4 + 2\ CaO$$

As silicon fluoride is formed, the calcium fluoride or fluorspar contents of the slag must decrease. This is shown by the following results, the first sample being taken immediately after solution of the fluorspar; that is, 10 minutes after addition, and the other samples at 10-minute intervals. The exact results of sulphur determinations in the steel and calcium fluoride in the slag were as follows:

Sulphur, per cent						
0.110	0.076	0.074	0.070	0.063	0.056	0.052
Calcium fluoride						
6.03	4.10	3.40	2.27	2.09	2.21	2.00

This shows that the decrease of the calcium fluoride only goes on to about 2.00 per cent, the samples taken during the last 30 minutes agreeing within allowable errors of analysis.

Seven finishing slags from seven heats in which fluorspar was used were then examined. The results were as follows:

Calcium fluoride Per cent	Fluorine Per cent
2.58	1.26
2.40	1.17
2.44	1.19
2.30	1.12
2.16	1.05
2.48	1.20
2.06	1.00

Here also, with sufficiently long working, the calcium fluoride content of the slag is reduced to 2 to 2.5 per cent and then remains practically constant. Whether the fluoride is all present as calcium fluoride or in some other form, was not determined, but the assumption made was that it was as calcium fluoride.

Up to now it also has been assumed that desulphurization, when fluorspar is used, was brought about by the slag being made more basic and yet remaining fluid enough to permit a good reaction. The following results will show that desulphurization cannot be laid to this cause. The finishing slags of two similar heats, one made without fluorspar additions and the other with fluorspar are given in Table XXVIII.

The basicity of the two slags expressed as the ratio of the oxygen of the bases to that of the acids is 1.67 in the first case, 1.30 in the second and yet the distribution coefficient in the first case is 3.50 and in the second, 7.30.

To obtain conclusive information, the following experiment was carried out: A 60-ton heat was taken and while working down, 4409 pounds of spiegeleisen was added. In half an hour the manganese was worked out and the bath was in such a condition that about half an hour's work with the finishing slag was required. An addition of 1984 pounds of fluorspar was made, the spar containing 95 per cent calcium fluoride. Samples of metal and slag were taken as shown in Table XXIX. Especially striking is the fact that the silica does not decrease, but increases notwithstanding the fact that the calcium fluoride reacts with the silica as shown by the white smoke from the chimney after each addition.

To investigate the matter further, samples were taken from another heat giving results as follows:

Test	Time		Silica per cent
1	10:28		17.23
	10:30	1764 lb. spar added	
2	10:33		17.05
3	10:37		16.18
4	10:43		17.08
5	11:13		17.70

This heat also shows the silica drops during the first seven minutes but then again increases. The slag takes up silica which must come from the furnace lining and it must be mentioned that there is a marked destruction of that part of the hearth and walls coming in contact with the slag. Through the fluorspar addition the slag has not become more basic. The sulphur in the bath, Table XXIX, is lowered from 0.081 per cent to 0.064 per cent and then 0.060 per cent. However, the sulphur is not increased in the slag, but is decreased and to a greater extent than is accounted for by the dilution of the slag by the spar additions. The same results were shown by another heat as given as follows:

Time	Sulphur in steel per cent	Sulphur in slag per cent
10:55	0.081	0.233
11:00	1764 pounds of spar added	
11:20	0.060	0.165
11:40	....	0.182
12:12	0.042	0.220
12:13	Heat tapped	

A careful balance of the sulphur in the heat given in Table XXIX shows that 40.54 pounds were volatilized. A test was carried out several times of taking outgoing gas from the furnace between the port and the air regenerator, through a water cooled pipe and bubbling through potash solution. The average showed 0.22 grams sulphur per cubic meter and theoretically there should be 0.213 from the producer gas. Similar tests were made after the addition of fluorspar, but this method did not show an increase in the sulphur content of the gas. This shows that the sulphur is not in the form of the trioxide, SO_3 but there is the possibility of a fluoride being present, such as for example, SFl_6. There is a possibility that such a compound would be precipitated by the low temperature of the water-cooled pipe so the gas was sucked hot through a porcelain tube and it was found that more sulphur was absorbed. The gas contained 1.966 grams per cubic meter and as 0.22 grams came from the producer gas, the remainder, or 1.766 grams, was volatilized from the slag. The amount taken for the test was 10 liters and the time was the seven minutes immediately following the fluorspar addition.

The conclusions drawn from the paper are:

If fluorspar is added to an open-hearth slag it is only decomposed and reduced to a certain limit, namely, from 2.0 to 2.5 per cent of calcium fluoride content. Silica is first removed from the slag as silicon fluoride, but immediately is replaced by silica from the furnace lining. Fluorspar is desulphurizing in its action in that sulphur is volatilized from the slag in some form, allowing the slag to absorb a further amount of sulphur from the steel.

Working the Heat

When the final slag first is added to the furnace it tends to cake, due to its chilling effect upon the already rather cold metal. In about five minutes after adding the first portion, this slag should be well rabbled, and the remainder of

Table XXVI

Sulphur Content Without Fluorspar

Analysis of metal					
Carbon	Manganese	Phophorus	Sulphur	Sulphur in slag	Distribution coefficient
0.12	0.56	0.04	0.06	0.14	2.33
0.12	0.47	0.03	0.08	0.27	3.37
0.12	0.56	0.07	0.08	0.19	2.37
0.11	0.53	0.05	0.09	0.34	3.77
0.08	0.53	0.04	0.09	0.35	3.90
0.11	0.53	0.06	0.08	0.20	2.50
0.10	0.44	0.04	0.08	0.26	3.25
0.16	0.50	0.03	0.09	0.32	3.50
0.09	0.44	0.04	0.09	0.30	3.33

Table XXVII

Sulphur Content With Fluorspar

Carbon	Manganese Analysis of metal	Phophorus	Sulphur	Sulphur in slag	Distribution coefficient
0.10	0.38	0.02	0.05	0.32	6.40
0.13	0.47	0.03	0.05	0.32	6.40
0.08	0.32	0.02	0.04	0.30	7.50
0.17	0.50	0.05	0.06	0.38	6.30
0.15	0.47	0.02	0.04	0.26	6.50
0.13	0.44	0.06	0.05	0.30	6.00
0.12	0.53	0.04	0.03	0.20	6.60
0.12	0.41	0.02	0.05	0.33	6.60
0.12	0.47	0.03	0.06	0.36	6.00

the slag carefully dusted over the entire bath. In about 15 minutes it will have become molten, but on taking a test will show heavy and black. Further additions of coke dust can be made, and slag tests taken at short intervals. As soon as the metal begins to heat, and deoxidation commences, this slag will turn to a brown color, and become rather porous in texture. Further reduction will change it to a light brown, then a dark gray, and finally into its proper powdering condition. During this period the slag should be rabbled occasionally to overcome any tendency to cake, and to assure of all the slag passing under the direct force of the arc. According to the consistency, additions of either lime, spar or sand may be required.

Slag too high in lime has a lumpy appearance in the furnace, the coke showing plainly on its surface. When poured and quenched in water, the test will show a light color, but will be thick and lumpy. Under these conditions it is hard for any entrapped gas to escape, and such a slag will hold back the completion of the heat in a serious manner. A few small additions either of fluorspar or sand will rapidly thin such a slag and transform it into an excellent foaming slag, powder on exposure to the air. Fluorspar is more beneficial than sand, due to its better power of desulphurization. A slag which comes up thick is beneficial from all points. It is a good carrier of heat and transmits most of the heat received from the arc into the metal with a minimum of radiation. It has poor powers of reflection, and is easy on the roof and walls. Such a slag will not corrode the banks, and is heavy enough to obviate any tendency of the coke entering the metal and raising the carbon.

Slags Too Thin

A thin, watery slag will reflect the heat badly to the roof and walls, resulting in a badly burned lining, will not heat the metal beneath, and will allow the carbon from the coke to contaminate the metal, resulting in a high analysis. Such a condition is caused by indiscriminate additions of sand, due to carelessness or a mistake in calculation, and immediately should be remedied by additions of lime. This quickly will thicken it, and bring it to its proper consistency. Such a slag has absolutely no powers either of deoxidizing or desulphurizing, and only results in delaying the heat, and cutting the banks. Such a slag may even pass over into one of acid composition, due to silica dropping from the roof and walls. A slag of this character will show either a whitish or a light blue, and will have a crystalline appearance when fractured, having something the appearance of glass.

Often, due to hearth troubles, the slag may become contaminated with magnesite either from the bottom or the side walls. This will result in a pasty heavy slag which it is impossible to clear. The only remedy for this is to make heavy additions of white sand and fluorspar until this heavy slag body is thin enough to pour. This slag should be drained from the furnace, and another one made. A sample of such a slag when water quenched and broken will have an appearance similar to porcelain, and will be strong and tough. Its color will run from a heavy black to a dirty, blue gray. It never can be converted into a finishing slag, and any metal poured under such conditions will never be of a suitable quality but will require heavy doping with aluminum to set quietly, and in the majority of cases will pour wild. Due to its dissolved oxide, such a steel will contain a large amount of cracks, tears, and inclusions all of which mitigate against its quality. If possible, the best thing to do with such a heat is to pour it into some cheap grade of bar stock, brakeshoes, sash weights, etc. However, in the ordinary shop such a recourse is seldom possible, and the heat must be finished under another slag.

Heavy additions of ground ferro-silicon sometimes will aid greatly in clearing such a slag, and at the same time assist in the elimination of gas.

In finishing a heat, a slag often will refuse to clear up, regardless of the amount of coke added. Such a condition is frequently met, especially in making steels of low carbon and alloy content. In such a case, the melter must resort to the use of silicon to act as his deoxidizing agent. This is crushed fine and dusted over the slag, especially under each electrode. The immediate result will be a thinning of the slag, requiring more lime to keep in its proper condition. The slag will react quickly to such a treatment, turning a lighter color immediately. If the lime is added properly with sufficient spar to prevent caking, the slag will quickly turn into one of a proper carbide nature.

Working a slag properly is a subject which is hard to describe, for the reason that it is seldom that the same set of conditions are found. Each must have a special treatment to obtain the desired result in the minimum of time. Certain points may be mentioned. In the addition of either lime, spar, or sand, do not add a large quantity at a time, but distribute the addition over a period by adding small lots periodically. This will eliminate any over addition requiring a working back, with its lost motion. It also is good practice to rabble the heat well after each addition to mix thoroughly the ingredients with the slag. Take plenty of slag tests, and keep right after a heat with as little lost time for each operation as possible.

Assuming that the slag is in its proper carbide state, there is only the one remaining step of finishing the metal before pouring the heat. This consists of three main points: Solidity, proper composition, and right temperature.

Table XXVIII

Open Hearth Slags With and Without Fluorspar

Without spar				With spar			
	Slag per cent		Steel per cent		Slag per cent		Steel per cent
SiO_2	15.20	C	0.16	SiO_2	19.63	C	0.12
Fe_2O_3	3.57	Mn	0.50	Fe_2O_3	2.86	Mn	0.41
FeO	8.14	P	0.03	FeO	11.57	P	0.02
Al_2O_3	2.14	S	0.09	Al_2O_3	3.36	S	0.06
MnO	5.41			MnO	5.63		
P_2O_5	4.76			P_2O_5	2.62		
CaO	46.50			CaO	45.98		
MgO	12.97			MgO	4.55		
S	.32			S	.44		
CaF_2	....			CaF_2	2.26		
S. Coeff	3.50			S. Coeff	7.30		

Deoxidizing the Metal

The slag being perfect, foaming slightly, and powdering in the air with an evolution of acetylene on exposure to water, the heat is given another heavy dusting of coke. Coke does not have to be used in this connection, anything furnishing a high enough carbon for perfect reduction such as coal, gas coke, or charcoal, being eminently satisfactory. However, there is always a good supply of coke *fines* on the market, which may be obtained much cheaper than any of the other materials mentioned. The doors are not tightly sealed with a clay mud, or with fine lime if they are tight fitting. Heavy flames of a soft, luminous character, and of a similar character to those from burning oil, will now come from the furnace through the electrode openings. Soon the furnace will begin to snow, or give off a heavy soot, due to the intense reduction, which will tend to collect on the

Table XXIX

Percentage Range of Elements with Fluorspar Additions

	Steel				Slag								
Time	C	Mn	P	S	SiO_2	FeO	Fe_2O_3	MnO	CaO	Al_2O_3	MgO	S	P_2O_5	CaF_2
2:15	0.145	0.35	0.026	0.081	19.90	10.80	2.14	17.07	38.80	2.08	6.16	0.21	2.68	....
2:30	0.115	0.32	0.033	0.083	17.90	10.67	2.71	16.77	39.30	3.16	6.35	0.25	2.52	....
2:32	4409 lbs. spiegeleisen added.													
3:00	0.175	0.44	0.038	0.081	17.85	10.67	1.57	17.28	39.90	2.57	6.85	0.36	2.50	....
3:01	1984 lbs. fluorspar added.													
3:11	0.120	0.38	0.027	0.064	17.60	11.44	1.57	15.83	34.65	2.36	7.29	0.26	2.29	6.34
3:21	0.100	0.33	0.030	0.060	18.05	11.70	2.14	16.25	35.18	1.90	6.65	0.25	2.21	5.25
3:23	661 lbs. speigeleisen added.													
3:33	0.100	0.35	0.030	0.060	18.25	11.70	2.71	16.02	35.50	2.51	7.15	0.24	2.13	3.49
3:34	Heat tapped.													

*Data in percentages.

water cooled roof glands, gradually closing the opening. As soon as this occurs the furnace is under a perfect reducing atmosphere, and the metal rapidly will be freed of both gases and sulphur. If a certain amount of sulphur is to be eliminated, the metal will have to be held until this is accomplished. If not it is safe to proceed.

Keep the Doors Closed

During this period it is well to caution against the constant opening of the doors of the furnace to take needless slag tests, allowing large amounts of oxygen containing air to enter the furnace. The writer has seen perfect carbide slags thrown back to a dead black by such a careless procedure. It is always well to keep an excess of coke on the slag to prevent any turning back when it is necessary to take a test.

A metal test taken should now show solid or nearly so. If not, a small amount of ferrosilicon, figured to 0.05 per cent, should be added, and the doors again sealed. Another test taken in about 5 to 10 minutes in all probability will show sound metal. If still blowy, the same action should be repeated until an absolutely sound test is obtained. Care must be exercised to keep the slag in a rather thick condition during this period, as the additions of silicon have a tendency to thin the slag to a point where it loses the greater part of its reducing powers. Such a test at this point should have an analysis of approximately 0.15 to 0.18 per cent carbon; 0.35 to 0.40 per cent manganese; and 0.05 to 0.10 per cent silicon.

Heater Casting Leaks

Question: We are having some trouble with a pipe shape casting 42 inches long, 12 inches diameter, 1 inch thickness of metal, closed at one end and with a flange 18 inches diameter, 1¾ inches thick at the other end. This casting must withstand a pressure of 300 pounds per square inch and usually it leaks at the junction of the flange with the barrel. The casting is gated at the joint on the flange and is poured horizontally in a green sand mold. No riser is taken off the flange, but a small riser is taken off the closed end. We shall appreciate any suggestion tending to improve our practice.

Answer: From your description of the method employed we are inclined to the opinion that your trouble is due to either dirt or shrinkage or possibly a combination of both. The flange offers the most convenient point to pour the casting, but on account of the comparatively large single gate, some dirt may pass in with the iron. This dirt may be slag on the iron or sand washed from a dirty basin or runner. This dirt if in sufficient quantity will remain in the flange clinging to some point on the face of the mold and may be found at any point on the circumference. Sometimes it may lodge immediately under the core and at other times it may float entirely round the flange and show up on the top side.

If your flask is comparatively shallow so that your pouring head is not high enough, it may be that your trouble is due to shrinkage. The trouble may be due to a flutter from the core, but that theory is rather weak since a flutter to show as a bubble on the barrel than as from the core would be more likely a porous place where the flange joins the body.

We suggest you pour the casting through four shallow branch gates 1½ x ¼ inch near the center of one side. Use a basin on top of the cope so that the iron will enter the upright runner quietly. Place a strainer core in front of or over the runner opening in the basin. See that the basin, runner and gates are perfectly clean. Place a riser on the flange about 2 inches diameter and carry it flared out to a basin at least 6 inches above the top of the flange. Pour the casting with hot, clean iron and bring the metal up slowly in the riser.

The National Automobile chamber of commerce estimates the 1923 consumption of copper in the manufacture of cars and trucks at 121,949,150 pounds, a gain of almost 17,000,000 pounds over 1922 and of over 38,500,000 over 1921.

Celebrates Fiftieth Anniversary

(*Concluded from Page* 858)

land Co-operative Stove Co. These were probably the first manufactured on a commercial basis. The first wet mills sold were installed by A. C. Williams, Chagrin Falls, O., and were devoted to cleaning sad irons. Square type tumbling mills were developed later and in 1893 a set of these mills was installed at the National Sewing Machine Co., Belvidere, Ill.

Mr. Sly later turned his attention to removing the dust and dirt from tumbling mills to improve the effectiveness of the tumbling action on the castings and to confine the dust which was a menace to workmen and to surrounding communities. This resulted in the invention and patenting of the cloth type dust arrester which to the present time is in a most universal use in foundries and in many other industries.

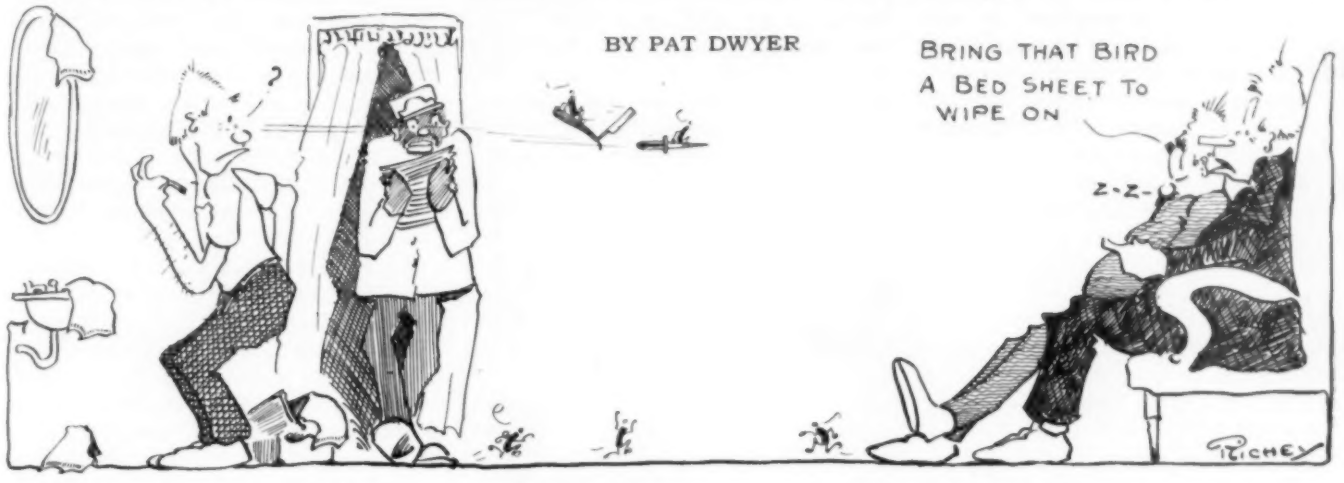
W. C. Sly, son of the founder of the company, entered the business at an early age as a partner with his father. Many of the early installations of cleaning room equipment were sold, installed, and operated under the personal supervision of the Messrs. Sly. They started experiments with various processes which resulted in the development of sand-blasting equipment. This line has in later years assumed prime importance among the products of the company.

In the past fifty years, the Sly factory has grown from a single room, to a modern manufacturing plant covering several city blocks, fully equipped with engineering and laboratory facilities.

The business is still entirely in the control of the Sly family, and is at present managed by the following officials: S. C. Vessy, president; George J. Fanner, vice-president; M. A. Sly, secretary; George P. Steele, treasurer; F. W. Klatt, general manage; F. A. Ebeling, sales manager; G. A. Boesger, chief engineer; E. L. Bottomley, superintendent.

Bill Notes Advance in Molding Machines

BY PAT DWYER



COMING down on the train from Milwaukee after the close of the recent convention of the American Foundrymen's association, Bill and I disposed ourselves comfortably in the smoking compartment for a quiet draft of the weed on the run to Chicago. I intimated to Bill that I was tired and that after I had finished my smoke I intended to relax and catch 40 odd winks before we arrived in the city. Bill grunted his approval. He said he had not had any too much sleep himself for several preceding nights and he also added that he hoped no other blighter of a stray passenger would invade the smoking room to bother us.

He had scarcely delivered himself of this touching and beautiful sentiment before a large and portly individual rolled into our midst. Bill looked at me and I looked at Bill and I imagine we both said the same thing to ourselves. It is possible that we employed different words, but I am sure the net result did not vary one tenth of one per cent. The bearing of the man was so confident and jaunty that I conceived a violent dislike for him immediately. His actions after entering the compartment tended to confirm me in my original estimate. He removed his coat and vest, his collar and tie, rolled up his sleeves and proceeded calmly to wash his face and both hands. On his first appearance, I had set him down as a real estate salesman of some kind, a realtor, a word which of course you know has been derived from the English word real the real thing, and toro, the Spanish for bull. The fact that he did not offer to shake hands with both of us upon his entrance led me to revise this opinion and I ventured another mental guess that he was a secretary of some fraternal association. I made no attempt to select the particular brand of association be represented. They all are built on the same general plan, they all function on similar lines and as you probably have noted, their executive secretaries all have the same family appearance.

However, a more or less cursory examination, disclosed neither watch charms or buttons on the coat and vest he had hung up, and reluctantly I was forced to the conclusion that both shots had gone wild, over, under, or to one side of the target. I leisurely reviewed all the other occupations with which I was familiar, I had plenty of time, but one by one I abandoned each theory in turn as wholly untenable. No evidence to support it.

As his toilet progressed I settled inevitably toward one final diagnosis and by the time he resumed his coat and vest I had him cataloged as one of the vast army of gentlemen engaged in the sale of drugs, or misses' and children's lingerie. Incidentally I learned one of the reasons why Pullman rates are so high. If every passenger required as many towels as this lad to wash his face, every through train would need to carry a laundry. The proceeding also suggested a nice little sum in mental multiplication. If a man requires 12 towels to wash one face and one pair of hands, how many towels would be required if he took a complete bath?

He practically emptied the rack and even then, if I had been selected as a judge, he would have received no medals in a beauty contest unless indeed he was entered in the Poland China class at a live stock show at the country fair. Hard words, says you my children, but consider the provocation.

Subsequent events proved how utterly unreliable are first impressions and I hereby tender upward of 50 abject apologies to a man I never had seen before and a man whom I probably never will see again.

He began by soaking one towel in the wash basin. He wrung it partly dry and wiped the arid and shiny area on top of his head from which the vegetation long since had vanished. He contemplated the towel carefully and then tossed it into a wire container in the corner.

He soaked a second towel in the water and used it as a wash rag to sluice his hands and arms. This towel was thrown in the discard to make room for another with which he carefully dried himself. He opened his bag and after rooting around in it for a few minutes he produced a bottle. He cupped his hand to receive some of the contents which he rubbed all over his head in the pathetic belief, I presume, that the age of miracles was not past and that while there was not the remotest possibility

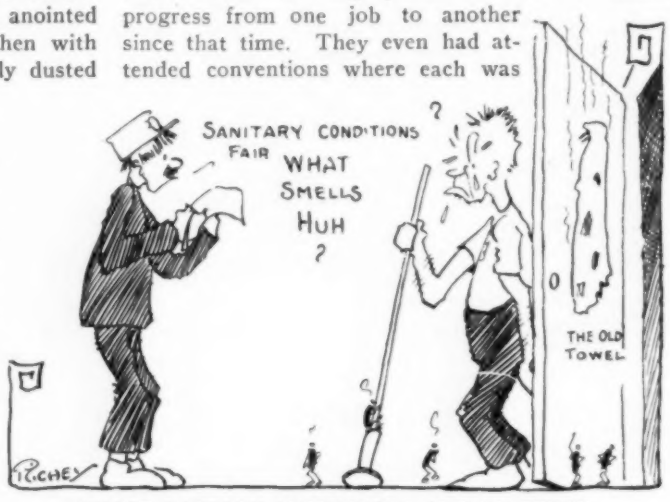
WHERE EVERY PROSPECT PLEASES—YOU SAY IT

of gathering figs from thistles or grapes from thorns, still hair *might* be induced to spring from an ivory dome. Another towel was employed to wipe the head and the hands and this towel also was tossed away with the others. He afterward washed his face, anointed it with fluid from a bottle, then with some kind of grease and finally dusted it with powder and used a fresh towel or two for each operation. For some time before the beauty session was over I noticed Bill and the visitor throwing covert glances at each other. Basing my opinion on a long and somewhat intimate acquaintance with Bill and his ways, I anticipated that he would not pass over the recent activities of the towel wrecker without some caustic comment. A natural reticence common to the average person and which prevents him from commenting on the actions of others, prevented me from expressing my opinion, but I knew that Bill had no scruples on that score. When he feels like saying anything he says it and what is more to the point, he actually seems to enjoy the performance, particularly if the party of the second part resents his interference.

Imagine my surprise when he jumped to his feet, slapped the gentleman on the shoulder, held out both hands and addressed the visitor as "Ed, you old son of a gun." Ed looked for a moment as if half minded to land him a swift one under the jaw and then a grin of recognition spread over his deeply cultivated and fertilized features He grabbed Bill's hands firmly and joyfully declared his soul would be condemned to eternal perdition if it was not old Bill, himself. Well, well, who ever would expect to bump into him away out here!

Bill introduced me with the qualifying clause that at one time I had been a foundryman in good standing, but in a moment of weakness had succumbed to temptation and had taken up writing for a living. "He claims he likes it" said Bill, "but that's all bunk. Pure laziness, that's all. He finds it easier to pound a typewriter than to pound sand." They both seemed to consider this an excellent jest which further was intensified when the big fellow intimated that although he was familiar with the name, he never would have recognized me from the pictures. Then we sat down and Bill and Ed plunged into a series of reminiscences that carried us into Chicago where we parted company much to our regret.

This was the first occasion on which the two men had met since they had worked for a gentleman affectionately known as the *AXE* in a South Boston shop back in the nineties. Their trails had crossed at many points in their progress from one job to another since that time. They even had attended conventions where each was present and yet by a queer freak of fortune they never actually had come into contact with one another. For many years Ed has had charge of a shop in the Chicago district, while of course as I have intimated elsewhere, Bill has established a permanent home in Cleveland or as near a permanent home as a foundry superintendent may be said to set up anywhere with the single exception of the one to which he is carried feet first.



THOSE FACTORY INSPECTORS ARE SO FUSSY

"Tell me," said Bill in the first lull in the conversation, "Tell me in the name of all the holy rollers, how, why, where, and when you acquired, picked up, developed or otherwise discovered your present super-refined method of washing your face and hands. If my blinkin' old memory serves me correctly it bears little resemblance to the lick and a promise that satisfied you when you were making cores for the *Axe*."

"Them was the days," said Ed, laughing at the memory. "I don't think. We washed in an old bucket in which the water was hard and either was cold or heated by dropping a piece of hot scrap into it. We dried our face and hands on the shop towel hung on a roller behind the coreroom door and religiously changed once a week whether it needed it or not. By Saturday it was so thoroughly impregnated with sand, paste and blacking that it might easily have been taken for a coal dust bag. It was no trouble to find it even on the darkest night with one's eyes shut and with the building full of steam. I think some bird out of that old shop invented the slogan 'Your nose knows.

"The odor bore no resemblance to that which according to the best authorities permeated the hanging gardens of Babylon. Neither was it reminiscent of my lady's bower or the bank where the wild thyme grows. I should loudly and abso-bally-lutely say not. That towel smelled like something that had fallen into a vat either in a tannery or a glue factory and then had been boiled in vinegar. Kinda sour, if you know what I mean. By Saturday night the towel was about as hard and stiff and about as soothing to the skin as a piece of stair carpet. I don't know where it was taken to be cleaned, but I imagine it must have been taken to one of these places on the edge of the town where by-products are extracted from the city garbage. According to all the standards set up for our guidance and according to all the usual articles of faith in which we are supposed to believe, this early experience should have caused me to form habits impossible to shake off. I should have become so deeply attached to the one-towel-a-week program that wild horses could not compel me to use any other. I don't know how this thing works out in the case of other people, but I do know that in my case the effect of this early training has driven me to the opposite extreme. When I now take a wash I use all the towels I can find and I figure that if I live to a hale old age and wash diligently in the meantime I probably will strike a fair average on the number of towels to which I am entitled as a free, white and independent citizen over 21."

Considered in that light Bill admitted that Ed's washing practice seemed to present several interesting and meritorious features. Personally he had no intention to adopt any of them. He looked upon washing as an ordeal of a somewhat painful character to be endured and gone through as rapidly as possible. His idea of a perfectly happy state of existence was personified in the lives of the South Sea Islanders who never washed.

"It's all a matter of personal taste," said Bill "whether a man washes himself or not. The theory that bathing is essential or even beneficial to health is all tommyrot. The enlightened white man uses water externally—a scattered specimen uses it internally—all the days of his life and the practice does not prolong his life one iota—whatever an iota is.

"He is bathed the instant he appears

in the world. He protests as loudly and vigorously as possible, but what does a feeble protest avail in the hands of a red faced and energetic nurse. He is regularly scrubbed by his mother—again under violent protest—night and morning during his school days. In the period usually known as the silly adolescent stage he voluntarily washes all that part of his gawky person showing beyond the collar and cuffs merely to conform to convention. After he grows up and attains a smattering of common sense he continues to wash because the practice has become a habit ingrained by the constant reminders of a fastidious partner who seems to think that the love, honor and obey part of the ceremony was spoken by him, and who—woman-like—attaches the most importance to the last word. Finally, the undertaker gets his hooks on to him and gives him a last bath before planting him. By this time the unfortunate creature has become reconciled to the inevitable and usually offers no protest.

"The South Sea islander, carefree, happy and independent never washes or is washed. In youth he gambols naked and unashamed. In manhood he applies a coat of paint in varigated colors to conform to social usage. In old age he adopts a plug hat to maintain his patriarchial dignity. To judge by the pictures of old, white-haired specimens we see occasionally, he attains a longer span of life than his mis-guided and be-tubbed white contemporary."

"I don't know where you spent your time in Milwaukee" said Ed, "or where you got the stuff, but certainly it must have contained more than the regulation 2.75 per cent dynamite to have affected you in that manner and for such a length of time after you—presumably—were driven under protest away from under the bunghole."

"Why you poor goof," he continued kindly. "You are whistling through your bonnet. Your valves are leaking. Cleanliness is next to Godliness and if that angle does not appeal to your warped mentality, I hope you will admit that cleanliness is the basis of foundation of cilivization. However, that is getting into deep water and I am not much of a swimmer. What did you think of the big show at Milwaukee?"

"Well" said Bill "I'll tell you. Whatever else civilization has done it has raised the foundry industry to a high state of perfection. I am not a patriarch, but I have been mixed up with the foundry business in one capacity or another for over 30 years and even in that time I have witnessed a practical revolution in the methods adopted for making castings. What is more to the point, nearly all the changes may be credited to the custom of holding conventions and exhibitions where the leading men of the industry exchanged views and demonstrated the value of mechanical equipment in foundry operation.

"Gradually the old rule of thumb methods have been superseded by scientific methods. The old cut and try practice has given place to accurate procedure based on an intelligent knowledge of the basic principles on which the art of founding in metals is based. Secret methods once jealously guarded have been dragged out of their hiding places and laid upon the dissecting table where students have had an opportunity of observing the why and the wherefore.

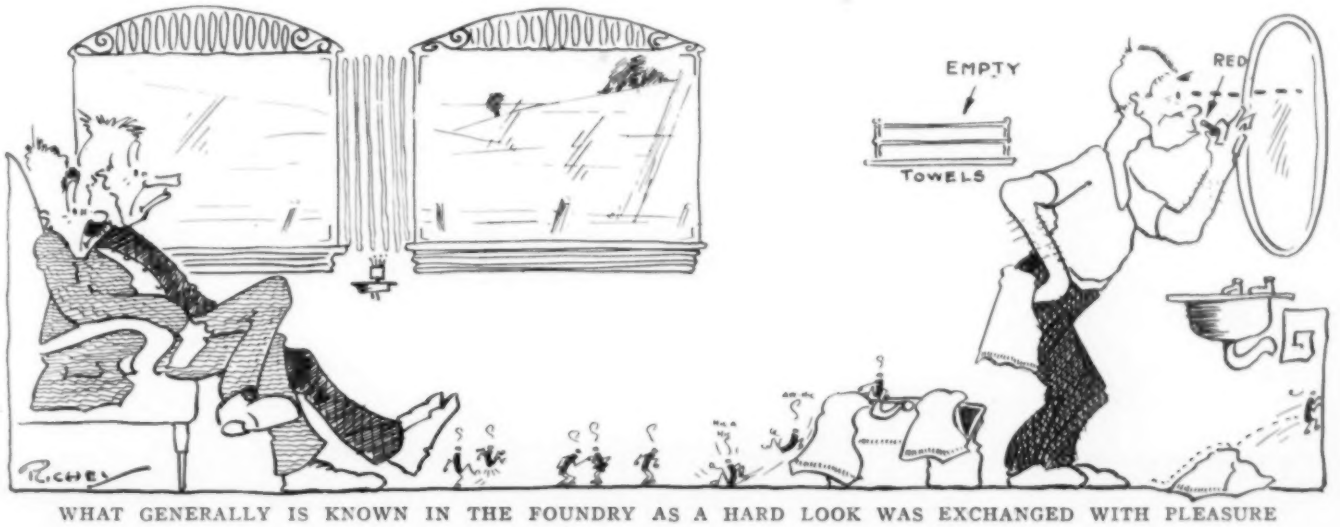
"Evolution in any line is a plant of slow growth and is influenced by the action of many men all working toward a common end, but along different paths. No one man knows it all nor is it within the capacity of any one man to bring any plan to perfection. For example consider the evolution of the molding machine and attempt to compare the many varieties of this device shown at the recent exhibition with the original plain little hand squeezer that first was tried out within the memory of men yet living.

"The basic principle was correct in that one movement compressed all the sand in a mold instead of depending on a great many movements as practiced when a mold is rammed by hand in the usual manner with a rammer. Under certain conditions, the plain squeezer still is able to hold its own in any competition, but under certain other conditions its place has been taken by machines operated by compressed air, by electric current and by hydraulic power. The hand squeezer is limited to small molds within the capacity of a man's strength, but, as recent practice has demonstrated, power operated machines are capable of handling almost any size of mold.

"These machines also indicate the many angles from which inventors have approached the same problem. In some instances the sand is squeezed into place, in others the sand is jolted so that it is packed by gravity and in still another instance a stream of sand is driven into a flask at a speed that packs it firmly into place."

"Wait a minute' Ed interjected at this point. "Wait a minute. Your talk has a strangely reminiscent sales tang to it. Are you by any chance interested in the sale of molding machines? If you are you may lay off right now. I made my selections before we left Milwaukee."

Average number employed in the manufacture of aluminum products during 1919 was 11,402 as compared with 9,584 in 1921. A classification covering the hours of labor shows that 49.9 per cent of the total number of employes work from 48 to 54 hours a week and the remainder, 35.7 per cent, from 54 to 60 hours, says the department of commerce.



WHAT GENERALLY IS KNOWN IN THE FOUNDRY AS A HARD LOOK WAS EXCHANGED WITH PLEASURE

Favors Research to Cure Gray Iron Atrophy

To THE EDITORS:

The editorial in your Oct. 1 issue doubtless will strike a responsive chord in the imagination of many in the gray iron industry. The nature of the individual reactions, of course, will vary according to the points of view of the individuals themselves.

You say "These facts" are—"in no sense a preliminary to an obituary of the gray iron industry. Gray iron castings are valuable for many purposes and can be made to bear much more of a share in engineering service. They have properties which too often are discounted"—and—the lack of definite standards made known through usage or through advertising has served to handicap gray iron.

"The field of service for gray iron can be enlarged. Research, co-operation in improving the quality of the metal, advancement of new ideas for uses of iron castings, and education of the buying public are needed in the industry."

All true. The key to this retrogression is *unreliable cast iron*. Reasonably uniform material is essential to standard practice. Constant improvement of a material is necessary to avoid its gradual, but sure, extinction. Speaking broadly, these fundamental requirements of uniformity and improvement in quality have not been met by the industry. There are notable exceptions—but they are comparatively few. These exceptions are largely in industries in which gray iron castings are not the primary product. For example, automobile manufacturers make automobiles, and cylinder blocks are incidental in production of machines. Jobbing foundries make castings—and it is in the jobbing field that least improvement seems to be encountered. Real opportunity exists for those who have vision to see what a progressive policy in regard to quality of materials will do for them—accomplished individually or perhaps best, through research groups. Other factors equal, those who invest in improved iron will have a better product, greater advertisement and increased good will. This will result in greater sales. By selling on a quality basis much of the present cut-throat competition could be avoided. Besides better iron, there will be considerable opportunity to standardize certain phases of operating conditions to effect some reductions in cost, and if properly done there would result a general toning up of the whole organization. It is always easier to sell if you know that you have the goods. Then there is always the chance that some development will lead to a radically new product. The exploitation of which might prove highly attractive.

How can one get this better material? Through research. Real research is the most hard-boiled sort of common sense. It requires vision—lots of it. It must be undertaken from a broad point of view. But in every industry that made a real effort, undermen who used business judgment as well as testing machines, research has paid. Research is business and business is not academic. Science is a tool—a powerful industrial tool. We cannot afford to play handmaiden to science, as is so often done. This tendency has led the so-called practical man to rather despise and always avoid the theoretical man—to their mutual disadvantage. Perhaps the technical man has made a fetish of research—through a lack of perspective putting the cart before the horse. The practical man sees only the absurdity of this arrangement and overlooks the potential pulling power of the horse. Here is an opportunity for good management—and the gray iron industry today offers a fertile field.

Research may be considered as of two general types—solution of direct practical problems, and fundamental, or so-called purely scientific research. The business man can see the value of the first type, but usually fights shy of the second. On this subject, that unique genius, the late Dr. Steinmetz, says—

"—There is no scientific investigation, however remote from industrial requirements, which might not possibly lead to industrially useful development. Experience, indeed, has shown that it is rare that sooner or later some industrially valuable results do not follow, no matter how obstruse and remote from apparent utility a scientific investigation may appear, and any scientific research whatsoever is thus industrially justified."

The accomplishments of this remarkable man bear tribute to the wisdom of his statement. Indeed, the phenomenal changes in our industrial and social life during the last two centuries are largely due to such developments. Splendid legal and philosophical codes have existed through the ages. Raw materials were even more plentiful. Take away research and we have lost the tool of progress.

Use research in the gray iron industry and retrogression will cease. In the gray iron industry today much improvement can come from better utilization of already existing knowledge. Higher standards rigidly enforced mean better cast iron. This is best accomplished through adherence to definite specifications. Cooperating groups, like those in the malleable and electric steel branches of the industry, for example, would do good in the gray iron field. Correlation of data, records of results, and cooperation in the operating end, are needed.

JOHN W. BOLTON, HAMILTON, O.

Usual Causes of Porosity in Cast Iron

By George A. Drysdale

Question: What method can be employed successfully to take care of porous spots in iron castings? Do you know of any preparation that we could use to close up the pores and at the same time stand a heat of 350 degrees Fahr.

Answer: Porosity in cast iron usually is due either to uneven contraction where the large section of a casting comes in contact with a much smaller section, or the nature of the iron mixture not being suitable for the work, in other words giving a metal which is open grained.

To overcome the porosity or sponginess in parts of a casting, it may be necessary to use chills in the mold at the sections where the sponginess occurs. Chills will have a tendency to close the grain of the larger sections. If the porosity is prevalent in a casting, it may necessitate changing the design, altering methods of gating or composition of the iron used. This will depend solely on local conditions.

Two treatments at times used in closing the grain of a leaky casting are as follows: A strong solution of salammoniac is used which promotes oxidation of the iron and tends to close the grain of the defective parts. The defective castings are put under pressure to force the salammoniac solution into the porous parts, and then a solution of soap is added. The combination of the latter with salammoniac forms an insoluable soap that tends to stop small leaks.

A strong solution of copper sulphate may be used. In this instance, the copper is recipitated in the porous parts of the casting and gradually fills the pores, stopping the leakage. However, it must be remembered that such solutions can be of use only where the seepage is not extensive.

The factory of the Buckeye Products Co., Cincinnati, O., manufacturer of foundry facings, supplies and equipment, recently was damaged by fire but not to such an extent as to hamper or interrupt business.

Milestones in Foundry Progress

As Recorded in the November Issues of THE FOUNDRY, Thirty, Twenty and Ten Years Ago

PLEASE enter my subscription for THE FOUNDRY for one year. In number of Dec. 10, 1893, an article was published on molding sand. If you have published anything of the same nature since, please send me copy containing it. Yours very truly,

THOMAS A. EDISON.

Thirty years ago, as today, keen inventive minds were drawn toward the study of sand, the artful use of which forms the basis of modern industrial machinery.

* * *

A bell weighing 1812 pounds was completed by Meneely & Co., West Troy, now Watervleit, N. Y., for the First Baptist church of Saratoga.

* * *

W. Edwards, in continuing the unvarnished history of a common man, recounted his travels through Louisiana, where he cut ties in the forests for 13 cents apiece. The tramp molder and his companion found the income of 70 cents a day too restricted, so they journeyed to Shreveport, where the narrator worked first as a carpenter and later as a molder until malaria made his emigration imperative. Quinine did not agree with him.

* * *

The Old Journeyman told of making a pattern 31 meters in diameter and 47 meters long. They worked on scaffolds beside the pattern, had to jack up the roof and tear out the side of the building to get it out of the pattern shop. They sure obtained some mileage on their liquid fuel in those days!

* * *

Robert A. Hadfield, Hadfield Steel Foundry, Sheffield, England, was married to Francis Belt Wickersham, Pittsburgh, on Sept. 19, 1894.

* * *

W. A. Jones, Chicago, operated the only foundry in that city that did not suspend operations during the panic.

* * *

James B. Clow & Son, Chicago, had completed a new foundry at New Philadelphia, O.

Faked Foundry Facts

Light Work

Dr. E. Kirk had a word of commendation for the melter, and urged a wider exchange of experiences on cupola operation.

* * *

Makers of sleigh shoes or runners with a view to meeting competition on a lower price, were advised to form the groove of green sand instead of using chills or cores.

* * *

Could not the same idea be applied to the skids that are being made for the use of various prominent politicians on Nov. 4, 1924?

LOUISIANA Purchase Exposition exhibits continued to fill the pages of THE FOUNDRY of November, 1904. The Alabama state section centered about a statue of Vulcan, made of iron, 56 feet high and weighing 60 tons. Arthur E. Barlow, Newark, N. J., illustrated the method of making malleable castings, and his booth was filled with ornamental examples of his product.

* * *

George H. Wadsworth, then with the Falls Rivet & Machine Co., Cuyahoga Falls, O., presented a paper on mechanically made cores at a meeting of the Philadelphia Foundrymen's association.

* * *

Iron was $12.25 a ton at central western furnaces.

* * *

Arthur Simonson discussed the small converter problem.

* * *

W. H. McFadden, Mackintosh-Hemphill Co. was president of the Pittsburgh Foundrymen's association.

* * *

A. T. Williams, Enterprise Mfg. Co., Philadelphia, was made president of the newly organized foundry foreman's organization of that city.

* * *

W. J. Keep advised an inquirer who wanted to know how to make hard iron soft and soft iron hard by dropping something into it, to get a partner who knew something about the foundry business.

* * *

The Buckwater Stove Co., Royersford, Pa., employing 200 men was building a foundry addition.

* * *

THE war had precipitated the business crisis which had been impending for a number of months, and this safely had passed due to growing exports relieving the demand for gold and thanks to the influence of the Federal Reserve banks. No. 2 pig iron was selling at $13 a ton, Chicago. Machine tool business was beginning to feel the beneficial effect of the war.

* * *

Pettibone, Mulliken & Co., Chicago, were erecting a foundry and pattern shop.

* * *

H. B. Smith Co., Westfield, Mass., had developed an exceptional system for making boiler sections. This was described by E. C. Kreutzberg.

* * *

Robert T. Kent, New York, had a special article on scientific management in the foundry which laid emphasis on the need for planning and routing the work.

THE FOUNDRY

Registered U. S. Patent Office

A semimonthly journal devoted to all branches of the foundry trade

Published by
THE PENTON PUBLISHING CO., CLEVELAND, O.

BRANCH OFFICES

BOSTON.....426 Old South Bldg.
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CINCINNATI.....406 Edwards Bldg.
NEW YORK.....2203-2206 No. 220 Broadway
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SAN FRANCISCO.....675 Monadnock Bldg.
WASHINGTON, D. C.....84 Home Life Bldg.

FOREIGN OFFICES

BIRMINGHAM, ENGLAND.....Prince's Chambers
LONDON, ENGLAND, 2-3 Caxton House, Westminster, S.W.1
PARIS FRANCE.....23 Rue de la Bienfaisance VIIIe
Cable address, IROTRAPEN, London

SUBSCRIPTION

United States and Mexico.....$3.00 a year
Canada.....$4.00 a year
Great Britain and other Foreign Countries.....£1:0:0 a year
Single Copies.....25 cents
Copies published three months or more previous to date of current issue, 50 cents each

ADVERTISING

All communications relating to advertising copy, discontinuances, etc., must be received on the 1st and 15th of the month preceding date of publication.

Member, the Audit Bureau of Circulations, Associated Business Papers, Inc., and National Publishers Association
Entered at the Post Office at Cleveland as Second Class Matter

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Given an Object Lesson

THOSE who spent the time necessary to make a first hand study of the apprentice training system in force in Milwaukee cannot but be impressed by the district plan. Many foundrymen attending the convention were conducted through the Milwaukee vocational school, the apprentice departments of the Falk Corp., Allis-Chalmers Mfg. Co. and other representative institutions. They were unanimous in their approval of the type of training offered and commented upon the high type of boys who are entering the foundry work.

In the sessions of the American Foundrymen's association devoted to industrial relations subjects the inherent features of the Milwaukee district system of apprentice training were made plain by R. J. Doty, Sivyer Steel Castings Co., H. S. Falk, and H. A. Frommelt, Falk Corp. and R. L. Cooley, director of the Milwaukee vocational school. Further, the apprentice's viewpoint was presented by men who actually had come through the entire course, appreciated the benefits and desired to tell others about them.

Milwaukee by no means is unique in the attempt to solve the foundry apprentice problem, but those who have observed the working of the training system in force agree that it is highly successful and worthy of emulation.

Weight Suggestion Gains Momentum

WHEN Thomas E. Durban, Erie Forge Co., Erie, Pa., wrote to the department of commerce recently suggesting placing the approximate weight of castings on all engineering drawings, as was noted in THE FOUNDRY, Sept. 1, 1924, he started a reform measure that is meeting with approval among foundrymen and manufacturers alike. A number of the large associations and technical bodies with those individually interested in the advancement of the industry have endorsed the proposal.

When a foundry receives a blue print of a casting upon which to make a tender, it is not uncommon in plants which do not employ an experienced estimator to find discrepancies in the estimated weight. Commonly the patternmaker is called in, if the foundry is to provide its own patterns and his figures seldom check the estimate made by the foundry superintendent or foreman.

Obviously, the designing engineer cannot be expected to be infallible in figuring the weight of a given part, but with the system of checking in vogue in machine designing departments it is reasonable to expect that the engineers' estimate is accurate. Further, a definite record is made of the estimated weight. This is available as long as the blueprint is in service. It saves duplication of effort all along the line and when a large number of blueprints are submitted simultaneously, the conversation of time is a large item.

THE FOUNDRY seconds Mr. Durban's suggestion.

Trade Outlook in the Foundry Industry

SLIGHT recessions are apparent in the rising tide of business which was noted early in September. Apparently many industries are marking time until after election, despite the general effort to discount the effect of political events upon the state of commercial health of the country. However, no feeling of apprehension is expressed, but rather manufacturers and foundrymen in particular are awaiting the mere passing of the election date before making definite pledges involving the purchasing of materials. As one foundryman at the Milwaukee convention of the American Foundrymen's association expressed it, "We will need some iron after Nov. 4 and we don't give a hang who is elected."

Farm Prospect Brighter

With rising prices for farm commodities, favorable outlook for crops maturing in the west, and mounting grain movement, the rural situation is highly satisfactory. This is reflected directly in the foundry industry, as is attested by the state of operation of malleable shops making implement specialties. The fall business among implement retailers has been heavy and in consequence farm machinery factories are active. A recently completed report of the department of commerce shows that in 1923 the total production of farm equipment was valued at $364,701,537, as compared with $209,639,897 in 1922. This gives 1923 an increase of 74 per cent over 1922. In analyzing these figures, the department showed that large increases had been made in the sales of tractors, harvesters and machines for preparing crops for market or use. The data covered reports from 1069 different manufacturing establishments in 1923 and of these the great majority were engaged primarily in the production of farm equipment, although a few reported such equipment as only a minor part of the total product. Illinois, Indiana and Ohio lead in the list of states making all varieties of farm machinery, while the western states predominate in threshing and tractor machinery.

Prices for Raw Materials for Foundry Use

CORRECTED TO OCT. 22

Iron		Scrap	
No. 2 Foundry, Valley	$19.00 to 19.50	Heavy melting steel, Valley	$17.25 to 17.50
No. 2 Southern, Birmingham	17.50 to 18.00	Heavy melting steel, Pitts.	19.00 to 19.50
No. 2 Foundry, Chicago	20.50 to 21.00	Heavy melting steel, Chicago	16.25 to 16.75
No. 2 Foundry, Philadelphia	20.76 to 21.26	Stove plate, Chicago	16.50 to 17.00
No. 2 Foundry, Buffalo	19.00 to 20.00	No. 1 cast, Chicago	19.00 to 19.50
Basic, Valley	19.00 to 19.50	No. 1 cast, Philadelphia	17.50 to 18.00
Basic Buffalo	19.00 to 19.50	No. 1 cast, Birmingham	14.00 to 15.00
Malleable, Chicago	20.50 to 21.00	No. 1 cast, Buffalo	17.00 to 17.50
Malleable, Buffalo	19.00 to 20.00	Car wheels, iron, Pittsburgh	18.50 to 19.00
Coke		Car wheels, iron, Chicago	18.00 to 18.50
Connellsville foundry, coke	$4.00 to 4.60	Railroad malleable, Chicago	17.75 to 18.25
Wise county foundry, coke	4.50 to 5.00	Agricultural mal., Chicago	16.50 to 17.00
		Malleable, Buffalo	18.00 to 18.50

Jobbing Work Spotted

The manufacture of jobbing castings reflects directly the state of trade in its customers' various lines. Gray iron cylinder shops in some cases are operating full, while in others stagnation prevails, depending entirely upon the activity of the various automobile plants. Foundries making municipal castings are fairly busy. Plumbing goods brass foundries are encountering a more active demand. Radiator fittings shops and those making small malleable specialties are busy. Building hardware sales are keeping step with a sustained building construction activity. In September, the awards in 27 northeastern states increased 4 per cent over August and 10 per cent over September, 1923. Bookings of miscellaneous steel castings showed a marked increase in September, according to the department of commerce. The total of contracts stood at 53.5 per cent of capacity in September, compared to 35.4 per cent for August and 35.6 per cent for July. Bookings of railway steel castings took a decided jump from 37.2 per cent of capacity in August to 75.6 per cent in September, while the total of steel castings booked increased from 36.1 per cent in August to 62.1 per cent in September.

Automobile Production

Statistics prepared by the department of commerce indicate that a total of 288,008 passenger automobiles and trucks were manufactured during September, compared with 279,061 for the previous month. While this does not indicate a decided gain, in the face of general conditions and the usual seasonal apathy, it is regarded as encouraging by automobile builders. Further, September deliveries were well ahead of July with its total of 262,916 and June with 245,919. The October output is expected to fall slightly below September, but sales have assumed a steady volume which indicates that the automobile business has emerged from the classification of a summer season business. Railway traffic continues to improve. The car service division of the American Railway association reported the number of surplus freight cars available on Oct. 7 at 103,730, a decrease of 12,959 compared with the number reported on Sept. 30. The total of freight cars awarded in September exceeded 27,600, the largest total for any single month in the past six years with the exception of two individual instances. Inquiries extant on Oct. 20 were said to exceed 20,000 cars. These factors have exerted a marked influence on the demand for railway specialty castings. The result on steel castings was noted in a preceding paragraph, while a similar condition is noted among manufacturers of railway malleable castings. Rolling mill activities are increasing sustained by the demand from railway sources and also from miscellaneous structural steel consumers. Rolling mills are booked in excess of their present capacity, and accordingly the orders for ingot molds, rolling mill machinery and rolls are increasing. Demand for machine tools is slightly stronger.

Nonferrous Prices

Increasing prices on nonferrous metals reflect a heavier demand from melters. New York prices on nonferrous metals according to the *Daily Metal Trade* of Oct. 22, follow: Casting copper, 12.75c to 12.87½c; electrolytic copper, 13.05c; Straits tin, 50.75c to 50.87½c; lead, 8.37½c to 8.50c; antimony, 12.00c; nickel, 33.00c; aluminum, No. 12 alloy, remelt, 21.50c to 22.00c. Zinc is 6.40c, E. St. Louis, Ill.

Comings and Goings of Foundrymen

LOUIS W. OLSON, factory manager of the Ohio Brass Co., Mansfield, O., whose election as president of the American Foundrymen's association was announced at the Milwaukee convention, was born in Wisconsin in 1878 and attended the public schools there. He was graduated from the University of Wisconsin in 1899, receiving a degree in electrical engineering. After two years, during which he was engaged in construction work, he became connected with the Ohio Brass Co. in the capacity of a draftsman. He was made factory superintendent of that organization in 1907 and assumed his present position as factory manager in 1920. Mr. Olson was president of the American Institute of Metals in 1912 and 1913.

LOUIS W. OLSON

Michael H. Connelly has been appointed sales manager of the General Steel Casting & Machine Co., Inc., the Albany Car Wheel Co., and the Reading Car Wheel Co., with offices at Newark, N. J.

Jacob Sonnenschein, who for the past 18 years has been selling gray iron and malleable castings for domestic foundries in New York, has opened an office in the Monadnock building, San Francisco, to act as manufacturers' agent and machinery importer.

J. F. Gaffney has been made foundry superintendent for the Toledo Machine & Tool Co., Toledo, O. Until recently Mr. Gaffney was connected with Hadfield-Penfield Steel Co., Willoughby, O., and previously he was foundry superintendent of the Bethlehem Steel Co. foundry, Sparrows Point, Md.

Emilio Elcoro, joint proprietor of Hyor de Valentin Elcoro, Mexico, D. F. included an inspection of the American Foundrymen's association exhibit in his recent tour of the United States.

J. R. King, formerly with the W. H. Howell Co., Geneva, Ill., now is superintendent of the Walworth Run Foundry Co., Cleveland. Previous to his connection with the Howell company he was superintendent of the Brillion Iron Works, Brillion, Wis.

A. B. Root Jr., mechanical engineer, Hunt-Spiller Mfg. Corp., Boston, has been elected to serve for one year as vice president of the American Foundrymen's association. Mr. Root was graduated from Tufts college in 1909 and shortly after became engineer of maintenance of ways, Boston & Albany railroad. For four years he was resident engineer for Stone-Webster Engineering Corp., Boston, in charge of hydro-electric and steam power plant construction throughout the western and southern states. In 1913 Mr. Root became associated with the Hunt-Spiller Mfg. Corp., as mechanical engineer, this concern specializing in the manufacture of air furnace gun iron castings. Mr. Root was president of the New England Foundrymen's association 1918-1919 and director of the American Foundrymen's association 1919-1920. He has devoted much time and energy to promoting the welfare of the foundry industry.

Direct Ohio Association

In presenting the list of members of the board of administration of the Ohio State Foundrymen's association on page 785 of the Oct. 1 issue, only the newly elected members were given. In addition to those listed, the holdover members include the following: Walter L. Seelbach, Walworth Run Foundry Co., Cleveland; F. W. Huber, American Rolling Mill Co., Middletown, O.; Joseph H. Bruce, Bowler Foundry Co., Cleveland; George H. Alten, Alten's Foundry & Machine Works, Lancaster, O.; A. H. Kramer, Advance Foundry Co., Dayton, O.; George W. Pichl, Wessling Bros. Foundry Co., Cincinnati, O.; H. Loudenslager, Loudenslager Foundry Co., Columbus, O.; L. H. Wise, H. V. Dockray Brass & Iron Co., Zanesville, O.; I. W. Warden, Wellston Mfg. Co., Wellston, O.; and W. E. Mathews, Bucyrus Road Machinery Co., Bucyrus, O.

Occupy New Foundry

The Wm. J. Sweet Foundry Co., formerly located at 2527 E. York street, Philadelphia, has moved into its new plant at Irvington, N. J. This concern specializes on monel and pure nickel castings to withstand corrosion and erosion. In conjunction with the Centricast Tube Co., New York, it also is preparing to produce seamless monel metal tubing as well as liners, cylinders cast by the centrifugal process. The officers of the company, W. J. Sweet, president, H. A. Cooper, vice president and C. C. Bruno, secretary-treasurer, were all at one time connected with the Bayonne Castings Co., Bayonne, N. J., and the International Nickel Co. of New York.

A. B. ROOT JR

Of the 240 making gas and oil stoves establishments reporting to the department of commerce for 1923, 43 were located in California, 40 each in Ohio and Pennsylvania, 24 in Illinois, 19 in New York, 11 in Missouri, 9 in Louisiana, Maryland, Massachusetts, Minnesota, Oklahoma, Oregon, Rhode Island, Tennessee, Texas, Washington, West Virginia and Wisconsin.

A. F. A. Banquet Reunites Old Friends

DR. G. W. DYER, Vanderbilt university, Nashville, Tenn., shown at the left in the accompanying illustration, paid high tribute to his friend Alfred E. Howell, past president of the American Foundrymen's association in the introductory remarks to an able address at the annual banquet. The meeting of these gentlemen was another chapter in a lifelong friendship, begun when Mr. Howell engaged in foundry work as a vocation and violin concert playing as an avocation in Nashville years ago. At present Mr. Howell directs one of the several soil pipe and stove pipe plants operated by W. J. Kirby, Somerville Stove Works, Somerville, N. J. Mr. Kirby is seated at the right and Mr. Howell is in the center of the group.

Investigate Cast Iron Pots for Aluminum

The purpose of an investigation, now being made by the United States bureau of mines at Pittsburgh, is to study the suitability of cast irons and related materials for use as pots in iron-pot melting furnaces for aluminum alloys. Wide differences are found to exist in commercial practice in the length of the life of pots.

Complete New Plant

The Midland Motor Cylinder Co., Ltd., of Dartmouth Road Foundries, Smethwick, Birmingham, Eng., have completed the layout of their Coventry foundry on up-to-date lines and with modern equipment. This company intends to effect similar improvements at their Smethwick foundries where work will be commenced soon. A large share of the work in connection with these alterations has been awarded to the Pneulec Machine Co., Ltd., of Mafeking road, Smethwick, Eng.

Eliminate Rough Surface

By George A. Drysdale

Question: Can you give us a core mixture that is suitable for making conduits and castings of similar character. We are anxious to eliminate the rough surface left on the castings due to the cores. The mixture we have been using for such castings consists of one part oil to 40 parts washed silica sand.

Answer: You should pay special attention to the sharp sand used in making the cores. It may be necessary to use a finer sand and tone down with a little molding sand if necessary or dip the cores in a plumbago wash of creamy consistency which will prevent the metal from eating into the core and eliminate the rough surface on the castings. Care must be exercised in the making of such cores. The ratio of oil to sand used will depend on the binding qualities of the oil used.

Change Company Name

The name of the Sandusky Foundry & Machine Co., Sandusky, O., has been changed to the Paper & Textile Machinery Co. No change of ownership, management or policy is involved.

Makes New Connection

A. A. Hutchinson, former manager of the Eastern Coal & Export Co., Richmond, Va., and recently president of the Hutchinson Engineering Co., Birmingham, Ala., has become connected with the field service staff of the Quigley Furnace Specialties Co., New York, as traveling sales manager with headquarters at Atlanta.

Appoint Representatives

Herbert C. Dingee, formerly with the E. J. Woodison Co., Detroit, and Taggart & Co., Philadelphia, and Angus D. Douglas will represent the Springfield Facing Co., Springfield, Mass., in the New England territory.

Take Larger Quarters

The U. S. Aluminum Match Plate Co., 1265 West 76th street, Cleveland, recently has moved into larger quarters. The company manufactures brass pattern castings in addition to aluminum match plate pattern and casting work.

Builds Foundry Addition

The John Harsch Bronze & Foundry Co., Cleveland, has built an addition to its metal room 40 x 40 feet which doubles the metal storage capacity of the plant.

Obituary

Patrick F. Bannon, president of the Farrell Foundry & Machine Co., Waterbury, Conn., for approximately 20 years, died at his home in that city, Oct. 19, aged 69. His death was due to acute indigestion.

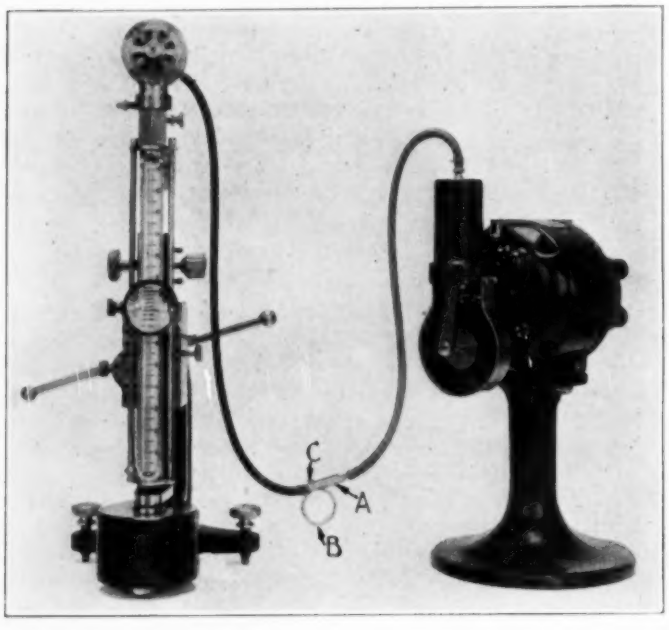
George Washington Lyndon, president of the Association of Manufacturers of Chilled Car Wheels, Chicago died suddenly, Oct. 8, at his home, 1720 E. Fifty-sixth street, Chicago. Mr. Lyndon became secretary and treasurer of the association in 1908 after a service of 12 years with the Griffin Wheel Co., and became president of the association in 1914. He was 65 years old and was known widely in the railroad field, being a prominent figure in the testing of railway materials and establishing standards. He maintained close relations with the University of Illinois, Champaign, Ill., and Purdue university, Lafayette, Ind., on railroad equipment matters.

William Yagle, for many years prominently identified with the foundry industry in Pittsburgh, died recently at his home in that city. He was 77 years old. For some time prior to 1883 he was associated with the James Marshall Foundry Co., in which year he organized the William Yagle Co., Ltd. He disposed of his interests in this company in 1912 to the Lawrence Foundry & Machine Co. and retired from active business. He was a charter member of the Pittsburgh Foundrymen's association of which he was president in 1898 and 1899. At the time of his death he was vice president of the Pennsylvania Savings bank.

The bars of working platforms of stationary furnaces should not be cast in the frame but should be inset. Solid metal plates should not be used because of the heat radiation.

Develop Motor Actuator for Scleroscope

The Shore Instrument & Mfg Co., Jamaica, N. Y., has issued bulletin No. 35 describing an automatic, electric-pneumatic, actuator for operating a scleroscope without the use of the usual rubber bulb and hand pressure. In many mass production operation, the scleroscope is used continuously throughout the work day during which time the operator is required to make several thousand tests. Such continuity of effort often is fatiguing to the opeartor, unless a change of activity is provided. This auxiliary actuating device has been devised to relieve the operator of muscular effort, except merely that of pressing a small trigger.



VERTICAL SCALE SCLEROSCOPE CONNECTED TO PNEUMATIC ACTUATOR MACHINE BY A RUBBER TUBE

The machine designed for this purpose is shown at the right in the accompanying illustration, while a vertical scale scleroscope is at the left connected to the former by a rubber tube. The controller valve is shown at *A*. *B* is the ring by which it is held by the operator's finger, and *C* is the trigger valve which is operated by another finger of the same hand. The electric motor operates continuously driving the pneumatic mechanism. It has the same suction and compressive force as the operator would supply the usual rubber bulb. It runs at a speed which is correct for operating the sceleroscope as in ordinary service. By this rarangement, a succession of tests may be made without the use of the trigger, except to hold it drawn in, making air connections with the motor. This enables the operator to pass the scleroscope over a surface to be tested to obtain a quick determination of uniformity, or the average hardness, which is important in advanced practice. The timing for drawing up the hammer, release and rebound, is automatic. Is so calulated that following each rebound the hammer is drawn up before it can fall back on the test specimen the second time.

Causes Responsible for Dirty Castings

Question: We have started to manufacture castings for oil burners and find they require closer grain iron than castings we have made heretofore. We have been using a mixture made up of pig iron 50 per cent, machinery scrap 25 per cent and shop scrap 25 per cent. Many of the castings contain blow holes and we are inclined to blame this condition on the shop scrap which is rather dirty. The greater part of this scrap is small and hard to clean. We shall appreciate your opinion on the cause of the dirty castings also on how to clean this light scrap.

Answer: Oil burner castings require a fairly close grain iron, but your present mixture should prove satisfactory. In the event that you want to produce a denser iron, the pig iron content may correspondingly. The limit is reached when the castings become too hard to machine economically. In extreme cases defective castings may be traced to dirty scrap. If the scrap is burned or thickly covered with rust, the resulting iron may be rotten or oxidized. If the scrap is thickly covered with sand some of the excess slag produced may be carried into the mold with the iron. However, this later is a remote contingency and we are inclined to the opinion that your trouble is due to some other cause either in the mold of the core. Many foundries clean their shop scrap gates, sprues, shot, etc., by passing it through the tumbling barrels with the castings, but in the majority of cases it is taken directly from the gangway to the charging deck. The amount of sand adhering to the scrap usually does not equal the amount adhering to sand cast pig iron and is not considered a detrimental element.

Give Suitable Mixtures for Grate Bars

By George A. Drysdale

Question: In reference to mixtures for grate bars, I have always run iron giving approximately the following chemical analyses: Silicon, 2.25; sulphur, 0.07; phosphorus, 0.30; manganese, 0.80 per cent. My impression was that the higher the combined carbon, the quicker it would burn out. Would an addition of steel be a detriment to the mix, on account of it containing a higher combined carbon?

Answer: The ideal grate bar is a white iron casting strengthened by tungsten and vanadium, but gray iron commonly is used. One authority advocates the us of malleable, bessemer pig iron as best adapted for such work and give the chemical analysis of the metal as follows:

	Per cent
Silicon	2.00
Sulphur	0.05
Phosphorus	0.20
Manganese	0.60
Total carbon	3.50

This calls for a medium silicon, low sulphur and phosphorus and rather high total carbon. The casting would contain approximately, 0.40 per cent combined carbon and 3.10 per cent graphite.

Another authority gives the following chemical analysis as best suited for grate bars:

	Per cent
Silicon	1.25 to 1.75
Sulphur	under 0.06
Phosphorus	under 0.20
Manganese	0.60 to 0.80
Combined carbon	0.50 to 0.70
Graphitic carbon	2.25 to 2.05

This analysis which is obtained through steel additions shows low silicon, sulphur, phosphorus and total carbon. The silicon as given in the inquiry shows that element to be much higher than shown in the analysis given. Although you have not given your combined and graphitic carbon, we assume that with the higher silicon, your combined carbon would be lower and your graphite higher.

It seems to us that the chief trouble with grate bars burning out is not altogether the composition of the metal as much as it is the abuse to which these castings are subjected by uneven firing when they are in use under the boilers. To overcome the trouble, it will be necessary to teach the average fireman how to fire correctly or the foundryman to make an absolutely fool-proof grate bar, which will be difficult to accomplish.

If a battery of furnaces is located in or near the center of the workroom, a hood at least 10 feet wide by 8 feet high should be placed above the entire line and dropped to within 6 feet 6 inches of the floor.

Show Reveals Live Prospects

Exhibitors Find Many Foundrymen Interested in New Equipment—Buying Throughout the Country Remains Light—Sales and Shipments in August Increases Over Total for July

BUYERS of foundry equipment apparently are holding off placing orders until after the votes are counted next Tuesday. The exhibition of foundry equipment and supplies held in Milwaukee in connection with the convention of the American Foundrymen's association produced may live prospects for the exhibitors and a number of those displaying products were successful in securing orders. A survey of the foundry industry indicates that the operating capacity gradually is increasing and this, together with the inquiries being received, has led builders to feel that conditions are becoming better.

Sales and shipments of foundry equipment in August, according to a report of the department of commerce, increased about 18 and 3 per cent, respectively, over July shipments and sales. Unfilled orders on Sept. 1 were below those of Aug. 1. The total value of sales in August was $244,408, as compared with $215,438 in July. The August shipments were valued at $284,607 as compared with shipments in July valued at $277,342. Unfilled orders on Sept. 1 totaled $378,016 as compared with a value of $410,694 on Aug. 1.

Believe Increase in Buying Is Near

FOUNDRY equipment manufacturers have had their inquiries greatly augmented by the recent show at Milwaukee but they have been unable to overcome the "wait until after election" intertia that has pervaded the foundries for the past fortnight. The National Engineering Co., Chicago, has placed one of its sand mixers in the plant of the Sivyer Steel Castings Co., Milwaukee, and another with the Fox Furnace Co., Elyria, O. It also has booked a sale to a foundry in Australia, the mixer to be shipped in 60 days. The Michigan Motor Casting Co. of the Buick Motor Co., Flint, Mich., has purchased eight tumbling mills from the W. W. Sly Mfg. Co., Cleveland, and sand blast equipment from the Pangborn Corp, Hagerstown, Md. The South Bend Foundry Co., South Bend, Ind., has purchased a tilted sand blast mill of the positive pressure type complete with a pressure tank and bucket elevator from the W. W. Sly Co. Other sales by the Sly company include dust arrester equipment to the Greenlee Foundry Co., Cicero, Ill., and spark arresters to the Packard Motor Co., Detroit.

Eastern Sales Light

IMPROVED operations at many of the foundries in the East are being reflected in a better demand for supplies, but not to any extent in the buying of the heavier equipment. Sellers of the latter state in some cases that while they have not had an opportunity to appraise fully the business placed during the month just closed, buying was little if any better than that awarded in September. One factor in the improved operations at some plants is railroad car business, which, while placed with car builders largely in September, just now is commencing to come through to a number of the foundries. This should be reflected soon in increased orders for equipment from these shops. The Goulds Mfg. Co., Seneca Falls, N. Y., has purchased sand blast equipment and the Oriskany Malleable Iron Co., Oriskany, N. Y., has secured 12 tumbling mills from the W. W. Sly Mfg. Co, Cleveland New foundry construction in this district is featured by a large addition to the Burlington, N J., plant of the United States Cast Iron Pipe & Foundry Co., to be used for the manufacture of pipe by the centrifugal process. While much of the equipment will of necessity be special, inquiries are expected for cupolas, cranes and some other items in the near future. Among recent foundry crane buyers are the Somerville Iron Foundry, Somerville, Mass., which closed on a I-ton handpower crane, 20-foot span, to the New Jersey Foundry & Machine Co., New York, and the Bierman-Everett Foundry Co., Irvington, N. J., which is understood to have purchased a 3-ton electric chain block hoist. The American Car & Foundry Co., New York, has closed on a 10-ton electric overhead crane to the Shaw Electric Crane Co., New York.

See Business Increased

MANUFACTURERS of foundry equipment in the Cleveland territory who exhibit products at the Milwaukee convention of the American Foundrymen's association found many live prospects which, they believe, will result in good sales in the near future Sales of equipment during the past two weeks have not been heavy. It is believed that this situation is due to the seeming uncertainty of the political situation and that no betterment will develop until after election. Nevertheless, builders of machines feel that the tone of the market is good and with the gradual increase in operating capacity of foundries, a satisfactory turnover seems assured for the remainder of the year. The Buffalo Foundry & Machine Co., Buffalo, has purchased sand blast equipment from the W. W. Sly Mfg. Co., Cleveland. The Ferro Machine & Foundry Co., Cleveland has secured dust arrester equipment from the Sly company as has the Atchison, Topeka & Santa Fe Railway, Topeka, Kan, through the Kirk & Blum Mfg. Co., Cincinnati.

Inquiries Are Maintained

IN THE territory adjacent to Pittsburgh, activity in connection with foundry equipment is only fair although the high inquiry rate is maintained. Occasionally a heavy order is taken, a case in point being that from a raditor company placed recently for about $9000 or $10,000 worth of core ovens the details being withheld. Some of the equipment and supply people returning from the Milwaukee foundry exhibition report a successful week although the actual business transacted was not heavy. However, considerable interest was aroused and plenty of prospects were developed. Several sales of sand mixers were made by the Blystone Mfg. Co., Cambridge Springs, Pa., and the Herman Pneumatic Machine Co., Zelienople, Pa., has a large number of inquiries on which it is working. Recent sales by that manufacturer include a large molding machine for making piano

plates to the Foster-Armstrong division of the American Piano Co., Rochester, N. Y.; a large rollover machine to the Bonney-Floyd Co., Columbus, O., and one to the Hunt-Spiller Mfg. Co., Boston. The Standard Sanitary Mfg. Co., Pittsburgh, has purchased sand-blast equipment and a dust arrester installation for its new plant at Baltimore from the Pangborn Corp., Hagerstown, Md. The National Tube Co., McKeesport, Pa., has secured sand blast equipment from the same manufacturer. Small sales of foundry supplies such as facings, core binders, flasks, etc., are noted. a foundry in Indiana is endeavoring to locate a 72-inch cupola and is interested in second-hand equipment available at Detroit. A Johnstown, Pa., foundry wants a 46-inch or 48-inch cupola, and one or two other users nearer by are interested in this type of equipment. The Werner Foundry, Inc., Landsdale, Pa., is expanding and will add to its equipment for making stove and heater castings. An inquiry from a distance is that of L. Imbleau & Son, Renfrew, Ont., for complete equipment for its foundry addition. Crane sales and inquiries appear spasmodically. The Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., sold a cupola charger and transfer crane to the Lynchburg Foundry Co., Lynchburg, Va. Annealing ovens and a 20-ton electric overhead traveling crane are to be purchased by the Modern Foundry Co., Oakley, Cincinnati.

Anticipate Greater Demand

SLIGHT improvement in the operating capacity of foundries in the New England territory has been reflected in a fair demand for foundry supplies and raw materials. However, sales of foundry equipment in that territory are practically nil. Manufacturers of equipment report that considerable inquiry developed at the Milwaukee exhibition and that a large portion of exhibits were sold while on display. Considerable interest in new equipment was aroused and builders are anticipating substantial sales of equipment to New England foundries in the near future. The American Schaeffer & Budenberg Corp., Boston, has purchased a dust arrester installation from the Pangborn Corp., Hagerstown, Md. Cinder mill equipment has been purchased by the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., from the W. W. Sly Mfg. Co., Cleveland. Inquiries are fairly heavy.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Guyan Machine Shops, Logan, W. Va., operator of a brass foundry, is reported as inquiring for several pieces of equipment.

Hilton Brass Foundry, 371 Boyden avenue, Hilton, N. J., plans purchase of several pieces of equipment.

R. B. Patch, 605 East Wilson street, Streator, Ill., is reported as inquiring for a used tumbling barrel and a 10-ton crane.

Imbleau Bros. Iron Foundry, Renfrew, Ont., plans constructing an addition to its foundry and is in the market for machinery with which to equip the new unit.

Troy Engine & Machine Co., Troy, Pa., operator of a gray iron foundry, plans construction of a test house and pattern shop. W. E. S. Dyer, Philadelphia, is architect in charge.

Chesapeake & Ohio railroad's repair shops at Huntington, W. Va., were damaged by fire recently with light loss. The railroad operates a brass foundry and pattern shop at Huntington.

Concrete and steel sand sheds are being constructed by the Northwestern Malleable Iron Co., Milwaukee, Wis. The buildings are expected to be in use soon. W. E. McMahon is vice president.

Continental Gin Co., Birmingham, Ala, operator of gray iron foundries and manufacturer of cotton machinery, has retained H. K. Ferguson Co., Cleveland, engineer and builder, for constructing addition to its machine shops.

Barrons Oil Burners, Ltd., Toronto, Ont., has been formed with $800,000 capital, to manufacture and deal in stoves, furnaces, heating appliances, etc., by George Barrons, Charles G. Watkins and Walter Stringer.

Alexandria Foundry, Machine & Boiler Works, Inc., Orleans, La., has been organized with $150,000 capital stock to operate foundries and machine shops and to do a miscellaneous metal working business.

Van-Cer Corp., Utica, N. Y., has been organized with 200 shares no par value stock to manufacture stoves, by C. H. Spencer, W. J. and H. Van de Walle, with F. J. Knorr, Albany, N. Y., as attorney.

Sterling Brass Co., 9600 St. Catherine street, Cleveland, operator of a brass foundry, has purchased a site in rear of its present location where it plans to erect a plant fronting on Union avenue.

Lunkenheimer Co., Cincinnati, manufacturer of valves and operator of gray iron, brass and aluminum foundries, has awarded contracts for constructing the suburb of Cincinnati, plant at Carthage, O., to which the Lunkenheimer Co. is transferring its operations.

Board of education at Tulsa, Okla., has taken bids for constructing a shop building at Eugene Field school, which will include various equipment for a machine shop and foundry. Frank E. Duncan is president of the Tulsa school board.

Rotary Steam Engine Corp., New York, has been incorporated with $150,000 capital to manufacture and sell engines, by G. J. Hermann, D. L. Hardenbrook, and H. P. Cahill, with V. N. Heermance, 16 Court street, Brooklyn, N. Y., as attorney.

Dixie Castings Co., 612 Fourth avenue north, Nashville, Tenn., manufacturer of machinery castings, plans increased production soon. Charles Longworth is president and general manager of the company and Frank Englert, vice president and secretary.

B. C. Valve Co., 514 Standard Bank building, Vancouver, B. C., has obtained a site on Main street in the False Creek industrial district where it plans constructing a plant including machine shop and foundry, tool room, settling and plating rooms, etc. Machinery and tools have not been completely purchased.

The Werner Foundry, Inc., Lansdale, Pa., operator of a gray iron foundry, has constructed a 52x208-foot addition to its plant and will increase its production of stoves and heaters. The company makes stoves, ranges, tank heaters and hot air furnaces. F. J. Werner is president and F. J. Werner, Jr., secretary and treasurer.

Shore Heating Corp., 111 West Washington street, Chicago, has been formed with $1,300,000 capital and 7000 shares no par value stock to manufacture and deal in devices for handling hydrocarbons and oils, either furnace-, stationary engines or engines, by George W. Hayden, Harry R. Vict and Francis B. Wilson.

Perfection Window Weight Co., 360 North Michigan boulevard, Chicago, has been formed with $300,000 capital, to manufacture and deal in window weights, machinery, equipment, etc., by C. W. Tarbert, H. E. Gnadt, and E. C. Smeltzer.

Anderson Engine & Foundry Co., Anderson, Ind., has been incorporated with $600,000 preferred and $801,000 common stock, to manufacture and sell castings, engines and other machinery, by Emerson E. McGuff, Eugene W. Cooney, Frank C. Hesch and Isaac E. May.

Miami university, Oxford, O., has awarded Boyajohn & Barr, Brunson building, Columbus, O., contract for constructing 1-story, 40x80-foot shops building for which miscellaneous equipment will be purchased. Herbert B. Briggs, Hartman Hotel building, Columbus, is state architect possessing the plans.

Hotz Foundry & Mfg. Co., Fremont, O., operator of brass and aluminum foundries and machine shops, has filed a schedule of liabilities and assets in federal court recently, after efforts of more than a year to escape bankruptcy court. Assets were listed as $21,700 and liabilities as $59,137.03.

New Trade Publications

CORE OILS—The Pneulec Machine Co., Ltd., Birmingham, England, has issued a folder describing its various core oils. A machine for mixing the oil also is described.

STEEL BUILDINGS—The Truscon Steel Co., Youngstown, O., has issued a folder describing the material of its manufacture which was used in the construction of a new foundry for the Studebaker Corp., South Bend, Ind. The general layout of the foundry is described.

TRUCKS—A combination floor and rail lift truck is designed for handling pig iron and scrap in foundries.